Colour Television **Chassis**

LC13E

AA

Service
Service
Service

Service Manual

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PHILIPS

1. Technical Specifications, Connections, and Chassis Overview

1.1 Technical Specifications

1.1.1 Reception

Tuning system	:	PLL
Colour systems	:	PAL B/G,
	:	PAL D/K,
	:	SECAM B/G,
	:	SECAM D/K
	:	SECAM L,
	:	SECAM L1
	:	
Sound system	:	2CS BG,
	:	NICAM B/G,
	:	NICAM D/K,
	:	NICAM I,
	:	NICAM L,
Built-in radio type	:	FM
Speakers	:	Full range
	:	13": 2 x 3 W_rms
	:	15": 2 x 3 W_rms
	:	20": 2 x 5 W_rms
Frequency bands	:	UVSH
IF Freq.	:	38.9 MHz
Channel selections	:	100 channels
	:	Full cable, UVSH
Aerial input	:	75 ohm
	:	Coax IEC-type
Pixel format	:	13": 640 x 480 (VGA)
	:	15": 1024 x 768 (XGA)
	:	20": 640 x 480 (VGA)
Viewing angle	:	13": 120 x 90 degrees
	:	15": 176 x 170 degrees
	:	17": 176 x 170 degrees

1.1.2 Miscellaneous

Mains voltage 13"/15"	:	External power Supply
	:	Input: 100-240 Vac,
	:	1.5 A
	:	Output: 12V dc,
	:	+/- 0.6 V, 60 W
Mains voltage 20"	:	External power Supply
	:	Input: 100-240 V ac,
	:	1.5 A
	:	Output: 24V dc,
	:	+/- 1.2 V, 120 W
Mains frequency	:	50/60 Hz
Operating temperature	:	+ 5 to + 35 deg. C
Storage temp.	:	-20 to 60 deg. C.
Maximum humidity	:	90% R.H. max (< 40(°C)
Power dissipation	:	13": 35 W
	:	15": 50 W
	:	20": 60 W
Standby Power dissipation	:	1 W
Weight	:	13": 4.5 kg
	:	15": 5.0 kg
	:	20": 8.5 kg
Dim. 13" model (WxHxD)	:	344x322x65 mm
Dim. 15" model (WxHxD)	:	377x361x70 mm
Dim. 20" model (WxHxD)	:	477x435x81 mm

1.2 Controls

1.2.1 Front + Top Controls

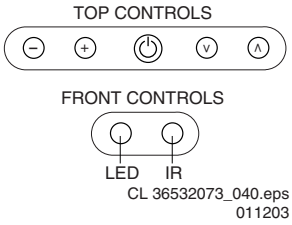


Figure 1-1 Front + Top Controls.

1.3 Connections

1.3.1 Left side Connections A/V

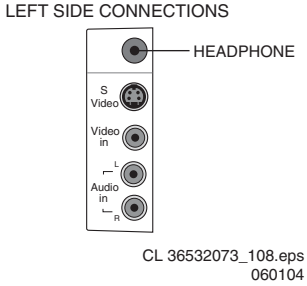


Figure 1-2 Left side connections.

Audio - Out

- Headphone, stereo	32 - 600 ohm/10 mW	3.5mm

S-VHS - In (Hosiden)

1 - Y	Ground	⏚
2 - C	Ground	⏚
3 - Y	1 Vpp/75 ohm	⊕
4 - C	0.3 Vpp/75 ohm	⊕

Video - In (Cinch)

- CVBS	1 Vpp/75 ohm	⊕◎

Audio - In (Cinch)

- Audio - L	0.5 Vrms/10 kohm	⊕◎
- Audio - R	0.5 Vrms/10 kohm	⊕◎

1.3.2 Bottom Connections

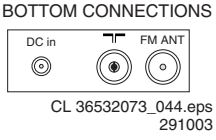


Figure 1-3 Bottom Connections

DC - In

-	13”/15”: 12 V_dc/5A/60 W 20”: 24V_dc/5A/60 W	

Aerial - In (IEC)

- IEC type	75 ohm, coax	

FM Ant (IEC)

- IEC type	75 ohm, coax	

1.3.3 Rear Connections

SCART EXT1 - In/Out (RGB/YUV and CVBS)

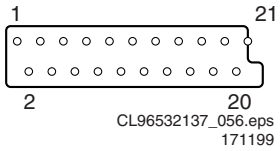


Figure 1-4 Rear connections

1 - Audio - R	0.5 Vrms/1 kohm	
2 - Audio - R	0.5 Vrms/10 kohm	
3 - Audio - L	0.5 Vrms/1 kohm	
4 - Audio	Ground	
5 - Blue	Ground	
6 - Audio - L	0.5 Vrms/10 kohm	
7 - Blue	0.7 Vpp/75 ohm	
8 - CVBS-status	0 - 1.3 V: INT 4.5 - 7 V: EXT 16:9 9.5 - 12 V: EXT 4:3	
9 - Green	Ground	
10 - N.C.		
11 - Green	0.7 Vpp/75 ohm	
12 - N.C.		
13 - Red	Ground	
14 - Blanking	Ground	
15 - Red	0.7 Vpp/75 ohm	
16 - RGB-status/ FBL	0 - 0.4 V: INT 1 - 3 V: EXT/75 ohm	
17 - Video in/out	Ground	
18 - RGB sw. ctrl	Ground	
19 - CVBS-out	1 Vpp/75 ohm	
20 - CVBS-in	1 Vpp/75 ohm	
21 - Common	Ground	

1.4 Chassis Overview

1.4.1 13”/15” model

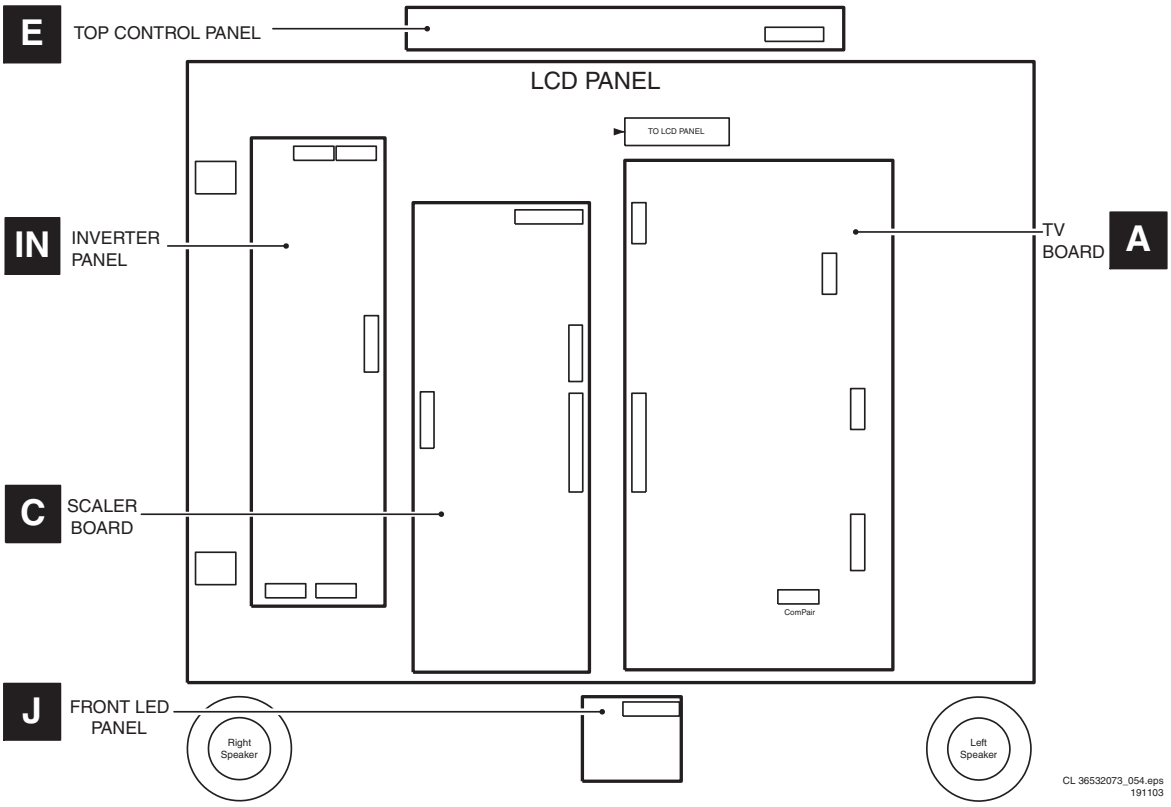


Figure 1-5 Chassis Overview 13”/15” model

1.4.2 20” model

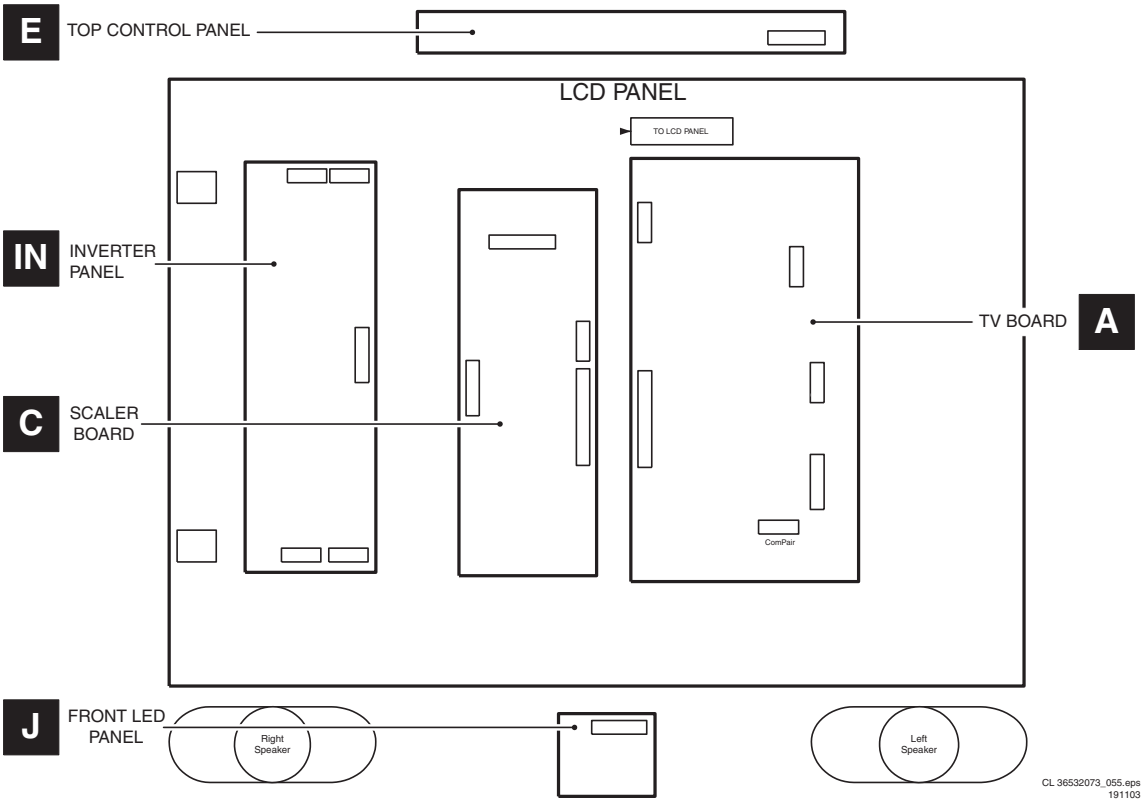


Figure 1-6 Chassis Overview 20” model

2. Safety Instructions, Warnings, and Notes

2.1 Safety Instructions

Safety regulations require that **during** a repair:
- Always connect the set to the mains via an isolation transformer (≥ 800 VA).
- Replace safety components, indicated by the symbol ⚠, only by components identical to the original ones.

Safety regulations require that **after** a repair, the set must be returned in its original condition. Pay, in particular, attention to the following points:
- Route the wire trees and HT cables correctly and fix them with the mounted cable clamps.
- Check the insulation of the mains lead for external damage.
- Check the cabinet for defects, to avoid touching of any inner parts by the customer.

2.2 Warnings

- All ICs and many other semiconductors are susceptible to electrostatic discharges (ESD). Careless handling during repair can reduce life drastically. Make sure that, during repair, you are connected with the same potential as the mass of the set by a wristband with resistance. Keep components and tools also at this same potential.
  Available ESD protection equipment:
  – Complete kit ESD3 (small tablemat, wristband, connection box, extension cable and earth cable) 4822 310 10671.
  – Wristband tester 4822 344 13999.
- Be careful during measurements in the high voltage section (on the inverter panel).
- Never replace modules or other components while the unit is switched 'on'.
- When you align the set, use plastic rather than metal tools. This will prevent any short circuits and the danger of a circuit becoming unstable.

2.3 Notes

2.3.1 General

- Clean the LCD display with a slightly humid cloth.
- Measure the direct voltages and oscillograms with regard to the chassis ground (⏚), or hot ground (⏚) as this is called.
- The direct voltages and oscillograms shown in the diagrams are indicative. Measure them in the Service Default Mode (see section “Service Modes”).
- Where necessary, measure the voltages in the power supply section both in normal operation (⏻) and in standby (⏻). These values are indicated by means of the appropriate symbols.
- The semiconductors indicated in the circuit diagram and in the parts lists, are interchangeable per position with the semiconductors in the unit, irrespective of the type indication on these semiconductors.

2.3.2 Schematic Notes

- All resistor values are in ohms and the value multiplier is often used to indicate the decimal point location (e.g. 2K2 indicates 2.2 kohm).
- Resistor values with no multiplier may be indicated with either an 'E' or an 'R' (e.g. 220E or 220R indicates 220 ohm).
- All Capacitor values are expressed in Micro-Farads (μ= x10^{-6}), Nano-Farads (n= x10^{-9}), or Pico-Farads (p= x10^{-12}).
- Capacitor values may also use the value multiplier as the decimal point indication (e.g. 2p2 indicates 2.2 pF).
- An 'asterisk' (*) indicates component usage varies. Refer to the diversity tables for the correct values.
- The correct component values are listed in the Electrical Replacement Parts List. Therefore, always check this list when there is any doubt.

2.3.3 Rework on BGA ICs

General

Although (LF)BGA assembly yields are very high, there may still be a requirement for component rework. By rework, we mean the process of removing the component from the PWB and replacing it with a new component. If an (LF)BGA is removed from a PWB, the solder balls of the component are deformed drastically so the removed (LF) BGA has to be discarded.

Device Removal

As is the case with any component, it is essential when removing an (LF) BGA that the board, tracks, solder lands, or surrounding components are not damaged. To remove an (LF)BGA, the board must be uniformly heated to a temperature close to the reflow soldering temperature. A uniform temperature reduces the chance of warping the PWB.
To do this, we recommend that the board is heated until it is certain that all the joints are molten. Then carefully pull the component off the board with a vacuum nozzle. For the appropriate temperature profiles, see the IC data sheet.

Area Preparation

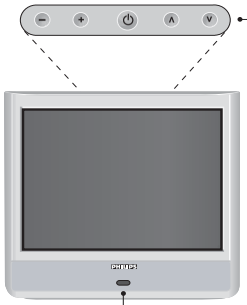
When the component has been removed, the vacant IC area must be cleaned before replacing the (LF)BGA.
Removing an IC often leaves varying amounts of solder on the mounting lands. This excessive solder can be removed with either a solder sucker or solder wick. The remaining flux can be removed with a brush and cleaning agent.
After the board is properly cleaned and inspected, apply flux on the solder lands and on the connection balls of the (LF) BGA.
Note: Do not apply solder paste, as this has shown to result in problems during re-soldering.

Device Replacement

The last step in the repair process is to solder the new component on the board. Ideally, the (LF)BGA should be aligned under a microscope or magnifying glass. If this is not possible, try to align the (LF)BGA with any board markers.
To reflow the solder, apply a temperature profile according to the IC data sheet. So as not to damage neighbouring components, it may be necessary to reduce some temperatures and times

3. Directions for Use

Presentation of the LCD Television

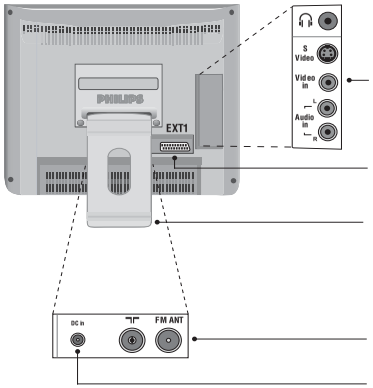


Television keys:
- ⏻: to switch the TV on or off.
- - + : to adjust sound level.
- ∧∨ : to select programmes.
- MENU: to access or close menus, simultaneously press the - and + keys. The ∧∨ keys can be used to select an adjustment and the - + keys to make that adjustment.

Note: when the CHILD LOCK function is activated the - + and ∧∨ keys are unavailable (refer to FEATURES menu on page 9).

On-light and infrared sensors.

Rear of set :
The main connections are made at the bottom of the television.
For more details on connections see page 12.



Side connections

EXT1 socket

Adjustable stand.
The stand can be removed and replaced with a wall mounting kit available as an option (ask your dealer).

TV and radio aerial sockets

DC supply socket

Remote control keys

Sound mode
Used to force programmes in STEREO and NICAM STEREO to MONO or, for bilingual programmes, to choose between DUAL I or DUAL II.
When the sound mode is switched to MONO, the indication is displayed in red.

Sleeptimer
To select the length of time before the set automatically switches to standby (from 0 to 240 minutes).

Screen information
To display / remove the programme number, the name (if it exists), the time, the sound mode and the time remaining on the timer. Hold down for 5 seconds to permanently display the programme number on the screen. The volume level and the smart control adjustments are then displayed each time they are used.

Menu
To call up or exit the menus.

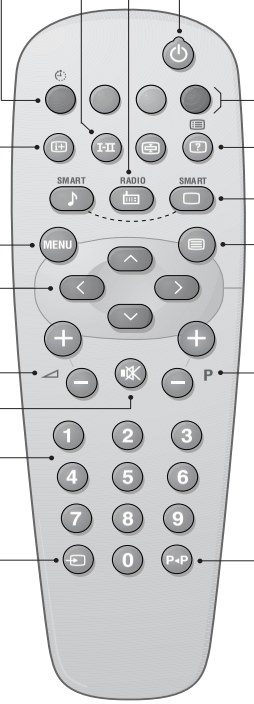
Cursor / Format 16:9
These 4 keys are used to navigate through the menus. The ◁▷ keys are used to enlarge or compress the picture vertically.

Volume
To adjust the sound level.

Mute
To mute or restore the sound.

Numerical keys
For direct access to programmes. For a 2 digit programme number, the 2nd digit must be entered before the dash disappears.

Select peripherals (p.11)
Press several times to select the required EXT connector.



Radio / TV mode
To switch the TV set to radio or TV mode .

Standby
To set the TV to standby mode. To switch the TV set on again, press ⏻, P − + or 0 9.

Teletext keys (p. 10)

List of programmes
To display/clear the list of programmes. Use the keys ∧∨ to select a programme and the key ▷ to display it.
The symbol 🔒 is displayed alongside all programmes which are locked (p.9) or 🔓 if they are not locked.

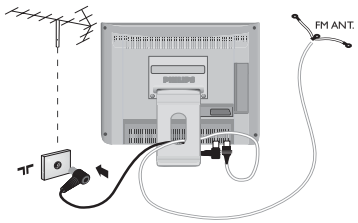
Smart picture and sound
Used to access a series of predefined picture and sound settings.
The PERSONAL *position relates to settings selected from the menus.*

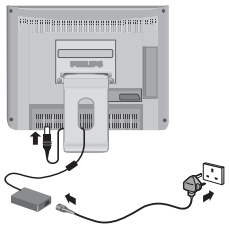
Teletext (p. 10)

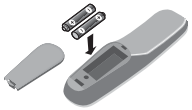
Selecting TV programmes
To move up or down a programme. The number, (the name) and the sound mode are displayed for a few seconds.
For some TV programmes the title of the programme appears at the bottom of the screen.

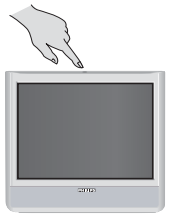
Previous programme
To access the previously viewed programme.

Installing your television set









❶ Positioning the television set

Place your TV on a solid stable surface. To avoid danger do not expose the TV to water, or a heat source (e.g. lamp, candle, radiator). Do not obstruct the ventilation grid at the rear.

❷ Connecting the aerials

- Connect the ⊓ socket situated at the bottom of the TV to your aerial socket.
- Insert the radio aerial lead supplied into the FM ANT socket located at the bottom of the TV.
- Arrange the leads by passing them through the television stand.

❸ Power supply connections

The TV works with a DC supply (the voltage is indicated on the label). Only use the AC-DC adaptor supplied with the TV.

- Connect the DC plug of the adaptor to the TV DC socket. Leave a space round the adaptor for ventilation.
- Insert the adaptor power lead and insert the mains plug into the wall socket.

For connecting other appliances see page p.12.

❹ Remote control

Insert the two R6-type batteries supplied, making sure they are the right way round.
The batteries supplied with the appliance do not contain mercury or nickel cadmium so as to protect the environment. Please do not discard your used batteries, but use the recycling methods available (consult your distributor).

❺ Switching on

To switch on the set, press the on/off key.
A green indicator comes on and the screen lights up. Go straight to the Quick Installation chapter on page 5. If the TV remains in standby mode (red indicator), press the P ⊕ key on the remote control.
The indicator will flash when you use the remote control.

Plug & Play

Quick installation

The first time you switch on the television, a menu appears on the screen. This menu asks you to choose the language of the menus :

If the menu does not appear, hold down the - and + keys on the set for 8 seconds to bring it up.

❶ Use the ⌃⌄ keys on the remote control to choose your language then confirm with ›.
❷ Then select your country using the ⌃⌄ keys and confirm with ›.
If your country does not appear in the list, select "…"
❸ Tuning starts automatically.
The operation takes several minutes.
A display shows the search status and the number of programmes found. When it has finished the menu disappears.
To exit or interrupt the search, press the MENU key.
If no programmes are found, refer to the chapter entitled Tips on p. 12.
❹ If the transmitter or the cable network broadcasts the automatic sort signal, the programmes will be correctly numbered.
❺ If not, the programmes found will be numbered in descending order starting at 99, 98, 97, etc.
Use the SORT menu to renumber them.
Some transmitters or cable networks broadcast their own sort parameters (region, language, etc.). Where this is the case, make your choice using the ⌃⌄ keys and confirm with ›.

Sorting programmes

❶ Press the MENU key. The main menu is displayed.
❷ Select INSTALL (⌄), then press ›.
The INSTALL menu appears.

❸ Using the ⌄ key, select SORT then press ›. The SORT menu appears. The FROM option is activated.
Note: this menu works as follows:
- *Change "FROM" (enter the current programme number),*
- *"TO" (enter the new number),*
- *EXCHANGE numbers" (the operation is carried out).*

❹ Select the programme you wish to renumber using ‹› keys or 0 to 9.
Example: to renumber programme 78 as 2 press 7 8.
❺ Select TO (using ⌄ key) and enter the new number with ‹› keys or 0 to 9 (for the example given, enter 2).
❻ Select EXCHANGE (⌄ key) and press ›.
The message EXCHANGED appears, the exchange takes place. In our example, programme 78 is renumbered as 2 (and programme 2 as 78).
❼ Select the option FROM (⌃ key) and repeat stages ❹ to ❻ as many times as there are programmes to renumber.
❽ To exit from the menus, press ⊞.

Choosing a language and country

1. Press the MENU key to display the main menu.
2. Select INSTALL (▽), then press ▷.
   The INSTALL menu appears.
   The LANGUAGE option is activated.

3. Press ▷ to go into the LANGUAGE menu.
4. Select your language with the △▽ keys.
   The menus will appear in the chosen language.
5. Press ◁ to exit the LANGUAGE menu.
6. Select the option COUNTRY and press ▷.
7. Select your country with △▽ keys.
   If your country does not appear in the list, select OTHER.
8. Press ◁ to exit the COUNTRY menu.
9. To exit from the menus, press ⊡.

Automatic tuning

This menu allows you to automatically search for all the programmes available in your region (or on your cable network).

1. First carry out operations 1 to 8 above, then:
2. Press ▽ once to select AUTO STORE then press ▷. The search begins.
   After several minutes, the INSTALL menu reappears automatically.

3. If the transmitter or the cable network broadcasts the automatic sort signal, the programmes will be correctly numbered.
4. If not, the programmes found will be numbered in descending order starting at 99, 98, 97, etc.
   Use the SORT menu to renumber them.
   Some transmitters or cable networks broadcast their own sort parameters (region, language, etc.). Where this is the case, make your choice using the △▽ keys and confirm with ▷.
   To exit or interrupt the search, press the MENU key.
   If no picture is found, refer to the chapter entitled Tips on p. 12.
5. To exit from the menus, press ⊡.

Programme name

You may, if you wish, give a name to the first 40 programmes (from 1 to 40).

1. Press MENU.
2. Select INSTALL (▽), then press ▷.
   The INSTALL menu appears.
3. Press ▽ 5 times to select NAME (concealed at the bottom of the screen), then press ▷.
   The menu appears :

4. Select the programme you wish to name using the keys 0 9 or − P +.
   Note: at the time of installation, the programmes are automatically named when the identification signal is transmitted.
5. Use the keys ◁▷ to move within the name display area (5 characters).
6. Use keys △▽ to choose the characters.
7. Press MENU when the name has been entered.
   The programme name is stored.
8. Repeat steps 4 to 7 for each programme to be named.
9. To exit from the menus, press ⊡.

Manual tuning

This menu allows you to store the programmes one by one.

1. Press MENU.
2. Select INSTALL (▽), then press ▷.
   The INSTALL menu appears.
3. Select MANUAL STORE (▽) then press ▷.
   The menu appears :

4. Press ▷ to go to the SYSTEM menu.
   Use △▽ to choose EUROPE (automatic detection*) or manual detection with WEST EUR (standard BG reception), EAST EUR (standard DK reception), UK (standard I reception) or FRANCE (standard LL').
   Then press ◁ to exit from the menu.
   ** Except for France (standard LL'): select the option FRANCE.*
5. Select SEARCH and press ▷.
   The search begins. As soon as a programme is found, the search will stop. If you know the frequency of the programme required, enter its number directly using the 0 9 keys and go to step 7.
   If no programme is found, refer to the Tips chapter on page 12).
6. If reception is un-satisfactory, select FINE TUNE and hold down ◁ or ▷ key.
7. Select PROG. NO (programme number) and use the ◁ ▷ or 0 to 9 keys to enter the desired number.
8. Select STORE and press ▷. The message STORED appears. The programme is stored.
9. Repeat steps 5 to 8 for each programme to be stored.

To exit: press the ⊡ key.

Using the radio

Choosing radio mode
Press the TV key on the remote control to switch the TV to radio mode.
In radio mode the number and name of the station (if available), its frequency and the sound mode are indicated on the screen.
To enter the name of the stations use the NAME menu. (p. 7)

Selecting programmes
Use the 0 9 or − P + keys to select the FM stations (from 1 to 40).

List of radio stations
Press the ☰ key to display / hide the list of radio stations. Then use the cursor to select a station.

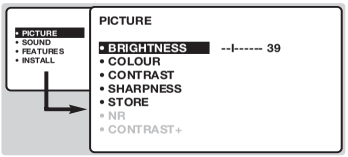
Using the radio menus
Use the MENU key to access the specific radio settings.

Searching radio stations
If you have used the quick installation all the available FM stations will be stored. To start a new search use the INSTALL menu :
AUTO STORE (for a complete search) or MANUAL STORE (for a station by station search).
The SORT and NAME menus let you classify or name the radio stations. These menus work in exactly the same way as the TV menus.

Screen saver
In the FEATURES menu you can activate / close the screen saver. The time, the frequency of the station and its name (if available) move across the screen.

Adjusting the picture

❶ Press MENU then ›.
The PICTURE menu appears :



❷ Use ‹ › keys to select a setting and ‹ › keys to adjust.
Note: the menu is a scroll-down menu. Keep the key ‹ held down to access the settings hidden at the bottom of the screen.

❸ Once the necessary adjustments have been made, select the option STORE and press › to store them.

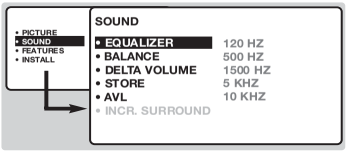
❹ To exit from the menus, press ⊡.

Description of the settings:

- BRIGHTNESS: alters the brightness of the image.
- COLOUR: alters the colour intensity.
- CONTRAST: alters the variation between light and dark tones.
- SHARPNESS: alters the crispness of the image.
- STORE: stores the picture settings.
- NR: attenuates picture noise (snow) in difficult reception conditions.
- CONTRAST + : To activate / de-activate the automatic contrast adjustment system (the dark areas are made darker whilst maintaining the detail).

Adjusting the sound

❶ Press MENU, select the SOUND option (‹) and press ›. The SOUND menu appears :



❷ Use ‹ › keys to select a setting and keys ‹ › to adjust.

❸ Once the necessary adjustments have been made, select the option STORE and press › to store them.

❹ To exit from the menus, press ⊡.

Description of the settings:

- EQUALIZER: to adjust the sound tone (from bass: 120 Hz to treble: 10 kHz).
- BALANCE: to balance the sound between the left and right speakers.
- DELTA VOLUME (volume difference): allows you to compensate for the volume differences between the different programmes or the EXT sockets. This setting is available for programmes 1 - 40 and the EXT sockets. Use the − **P** + keys to compare the level of different programmes.
- STORE: stores the sound settings.
- AVL: automatic volume control used to avoid sudden increases in volume, particularly when changing programmes or during advertisements.
- INCR. SURROUND: To activate / deactivate the surround sound effect. In stereo, this gives the impression that the speakers are further apart. In mono, a stereo spatial effect is simulated.

Feature settings

❶ Press MENU, select FEATURES (‹) and press ›. You can adjust:

❷ TIMER, PARENTAL CONT. and CHILD LOCK : see next page

❸ MODE SELECT.: to switch the TV in radio or TV.

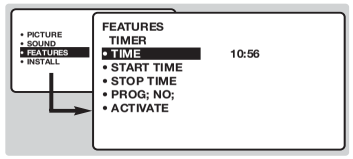
❹ To quit the menus, press ⊡.

Timer function

This menu allows you to use your TV as an alarm clock.

❶ Press MENU.

❷ Select FEATURES (‹) and press › twice.
The TIMER menu appears :



❸ Press › to enter and exit the sub-menus and use keys ‹ › to adjust:

❹ TIME: enter current time.
Note: the time is updated automatically each time the set is switched on using teletext information taken from programme 1. If programme 1 does not have teletext, the update will not take place.

❺ START TIME: enter the start time.

❻ STOP TIME: enter the stop time.

❼ PROG. NO.: enter the number of the programme for the wake-up alarm. For models equipped with a radio, you can select an FM station by using the ‹ › keys (the 0 9 keys are only used to select TV programs).

❽ ACTIVATE: you can set the alarm to be activated:
- ONCE ONLY for a one-off alarm,
- DAILY for a daily alarm or
- OFF to cancel.

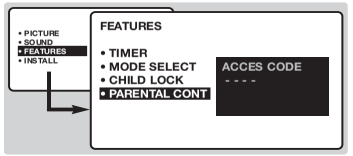
❾ Press ⏻ to set the TV to standby. It will automatically switch on at the time programmed. If you leave the TV switched on, it will only change programme at the time indicated.
The combination of the CHILD LOCK and TIMER functions may be used to limit the length of time your television is in use, for example, by your children.

Locking the set

You can bar access to certain programmes or completely lock the set by locking the keys.

Locking programmes

❶ Press MENU.



❷ Select (‹) and press ›.

❸ Select PARENTAL. CONT. (‹) and press ›.

❹ Enter your confidential access code. The first time, enter the code 0711 then confirm by re-entering 0711. The menu appears.

❺ Press › to go into the menu.

❻ Use keys ‹ › to select the required programme and confirm with ›. The symbol 🔒 is displayed alongside the programmes or sockets that have been locked.

❼ Press ⊡ to exit.
To watch a programme which has been locked you will now need to enter the confidential code; otherwise the screen will remain blank.
The INSTALL menu access is also locked.
Caution: in the case of encrypted programmes which use an external decoder, it is necessary to lock the corresponding EXT socket.

To unlock all programmes
Repeat stages ❶ to ❹ above, then select CLEAR ALL and press ›.

To change the confidential code
Repeat stages ❶ to ❹ above, then:

❺ Select CHANGE CODE and enter your own 4-digit number.

❻ Confirm by entering it again.
Your new code will be stored.

❼ Press ⊡ to exit from the menus.
If you have forgotten your confidential code, enter the universal code 0711 twice.

Locking the keys

❶ Press MENU, select FEATURES (‹) and press ›.

❷ Select CHILD LOCK (‹) and press › to set the lock to ON.

❸ Switch off the set and put the remote control out of sight. The set cannot be used (it can only be switched on using the remote control).

❹ To cancel: switch CHILD LOCK to OFF.

Teletext

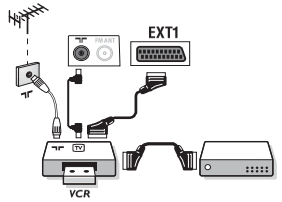
Teletext is an information system broadcast by certain channels which can be consulted like a newspaper. It also offers access to subtitles for viewers with hearing problems or who are not familiar with the transmission language (cable networks, satellite channels, etc.).

Press :	You will obtain:
Teletext on/off	This is used to call teletext, change to transparent mode and then exit. The summary appears with a list of items that can be accessed. Each item has a corresponding 3 digit page number. *If the channel selected does not broadcast teletext, the indication 100 will be displayed and the screen will remain blank (in this case, exit teletext and select another channel).*
0/9 or P+/− **Selecting a page**	Enter the number of the page required using the 0 to 9 or P+/− keys. Example: page 120, enter 1 2 0. The number is displayed top left, the counter turns and then the page is displayed. Repeat this operation to view another page. *If the counter continues to search, this means that the page is not transmitted. Select another number.*
Direct access to the items	Coloured areas are displayed at the bottom of the screen. The 4 coloured keys are used to access the items or corresponding pages. *The coloured areas flash when the item or the page is not yet available.*
Contents	This returns you to the contents page (usually page 100).
Enlarge a page	This allows you to display the top or bottom part of the page and then return to normal size.
Stop sub-page acquisition	Certain pages contain sub-pages which are automatically displayed successively. This key is used to stop or resume sub-page acquisition. The indication appears top left.
Hidden information	To display or hide the concealed information (games solutions).
Favourite pages	Instead of the standard coloured areas displayed at the bottom of the screen, you can store 4 favourite pages on the first 40 channels which can then be accessed using the coloured keys (red, green, yellow, blue). Once set, these favourite pages will become the default every time tetetext is selected. ❶ Press the MENU key to change to favourite pages mode. ❷ Display the teletext page that you want to store. ❸ Press then the coloured key of your choice. The page is stored. ❹ Repeat steps ❷ and ❸ for the other coloured keys. ❺ Now when you consult teletext, your favourite pages will appear in colour at the bottom of the screen. To temporaly retrieve the standard items, press MENU. *To clear everything and return the standard items as the default, press for 5 seconds.*

Connecting peripheral equipment

The EXT1 socket has audio, CVBS/RGB inputs and audio, CVBS outputs.

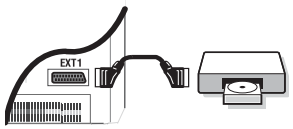
Video recorder



Video recorder (or DVD recorder)
Carry out the connections shown opposite, using a good quality euroconnector cable.
If your video recorder does not have a euroconnector socket, the only connection possible is via the aerial cable. You will therefore need to tune in your video recorder's test signal and assign it programme number 0 (refer to manual store, p. 7).
To reproduce the video recorder picture, press 0.

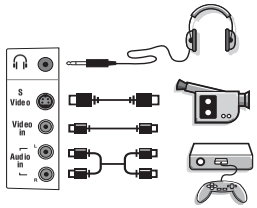
Video recorder with decoder
Connect the decoder to the second euroconnector socket of the video recorder. You will then be able to record scrambled transmissions.

Other equipment



Satellite receiver, decoder, DVD, games, etc.
Make the connections as shown opposite.

Side connections



Make the connections as shown opposite. With the key, select **EXT3**.
For a monophonic device, connect the audio signal to the AUDIO L input. The sound automatically comes out of the left and right speakers of the set.

Headphones
When headphones are connected, the sound on the TV set will be cut. The P+/− keys are used to adjust the volume level.
The headphone impedance must be between 32 and 600 Ohms.

To select connected equipment

Press the key to select **EXT1** and **EXT3**.
Most equipment (decoder, video recorder) carries out the switching itself.

4. Mechanical Instructions

Index of this chapter:

Note: Figures below can deviate from the actual situation, due to different set executions and screen sizes.

4.1 Service Position

First, put the TV in its service position. Therefore, place it upside down on a tabletop, use a protection sheet or a foam cushion. Take care that this is flat and free from obstacles like screws, to prevent damaging the fragile LCD screen. ESD protective service buffers, as shown below, can be used (3122 785 90580).

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Figure 4-1 Service position with ESD protective service buffers

4.2 Rear Cover Removal

1. Use a Torx (T10) screwdriver to remove the rear cover by unscrewing and removing the screws as indicated by the figures: Rear cover removal 13-inch and 20-inch.
2. Make sure all power-, audio-, video-, coax-, cinch- and SCART cables are unplugged.
3. The number of Torx screws to be removed are: six for the 13- and 15-inch version and seven for the 20-inch.
4. Carefully remove the rear cover and store it on a safe place.

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Figure 4-2 Rear cover removal 13- and 15-inch

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Figure 4-3 Rear cover removal 20-inch

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Figure 4-4 Rear cover removal hidden screw EU version

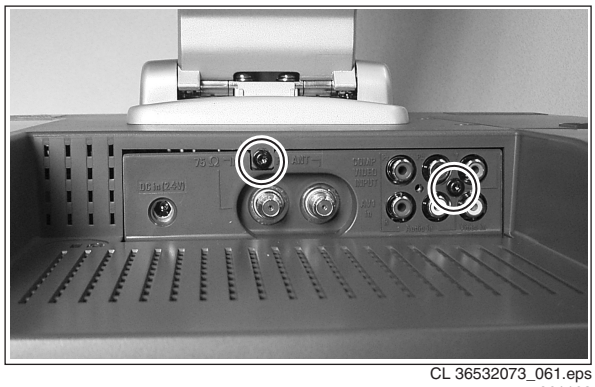

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Figure 4-5 Rear cover removal hidden screws US version

4.3 I/O Cover Removal

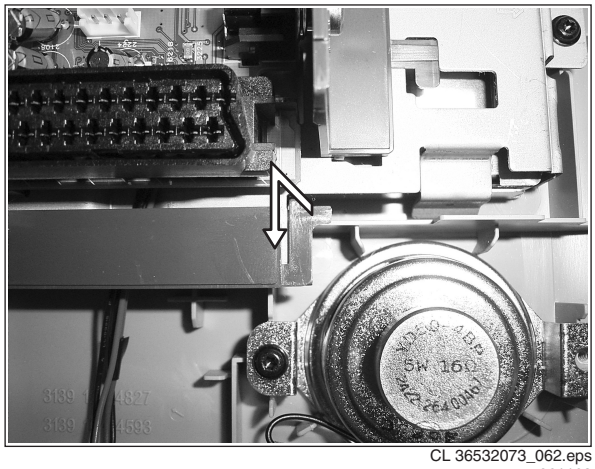

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Figure 4-6 IO cover bottom

1. Lift up the tag (securing clip) at the right side of the IO cover and at the same time pull it away from the TV board.

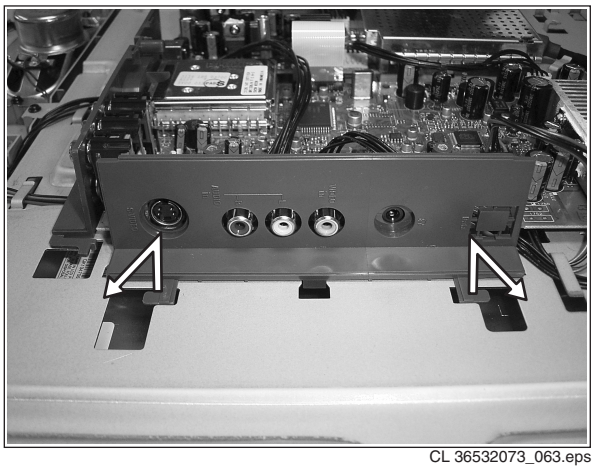

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Figure 4-7 IO cover side

1. Lift up both tags (securing clips) and at the same time pull it away from the TV board.

4.4 LED/Remote Control Board Removal

1. Unlock the securing clip, which holds the PWB in place, and take out the LED/Remote control PWB.

4.5 TV Board Removal

1. Disconnect all four PWB connectors out of the regarding sockets 1231, 1234, 1732 and 1902.
2. Pull the thin flat cable out of its special shaped connector, 1010.
3. Unscrew and remove the two PWB mounting screws.
4. Take out the TV board in the indicated direction.

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Figure 4-8 TV board

Note: Sometimes it is necessary to place the Scaler board in a service position. In this case, it is necessary to use the specific “Repair kit scaler board” including two extra long cables (order nr. 3122 785 90490).

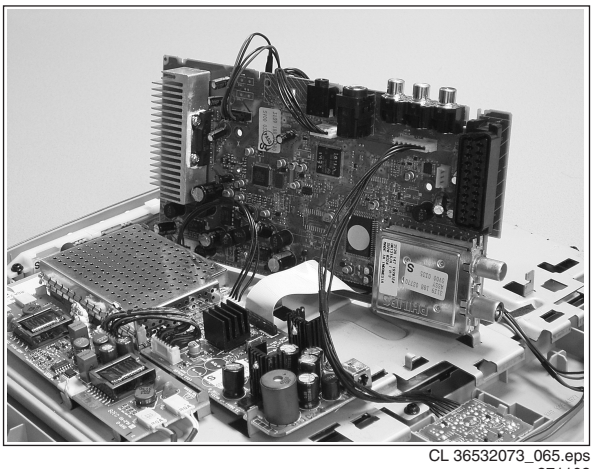

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Figure 4-9 Service position TV board

4.6 Scaler Board Removal

4.6.1 13 and 20 inch versions

1. Carefully remove the shielding covering the top part of the Scaler board.
2. Carefully disconnect the TTL cable connector in the centre of the board (1501). Take care not to damage the fragile cables.
3. Disconnect the cable connectors at the edge of the board (1342 and 1003).
4. Pull the thin flat cable out of its special shaped connector (1681).
5. Unscrew and remove both PWB mounting screws.
6. Take out the Scaler PWB.

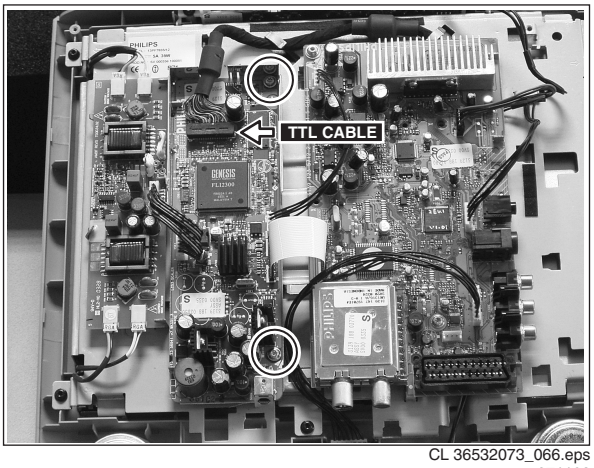

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Figure 4-10 Scaler PWB

4.6.2 15 inch version

1. Carefully disconnect the LVSD cable connector at the top of the board (1506). Take care not to damage the fragile cables.
2. Disconnect the cable connectors at the edge of the board (1342 and 1003).
3. Pull the thin flat cable out of its special shaped connector (1681).
4. Unscrew and remove both PWB mounting screws.
5. Take out the Scaler PWB.

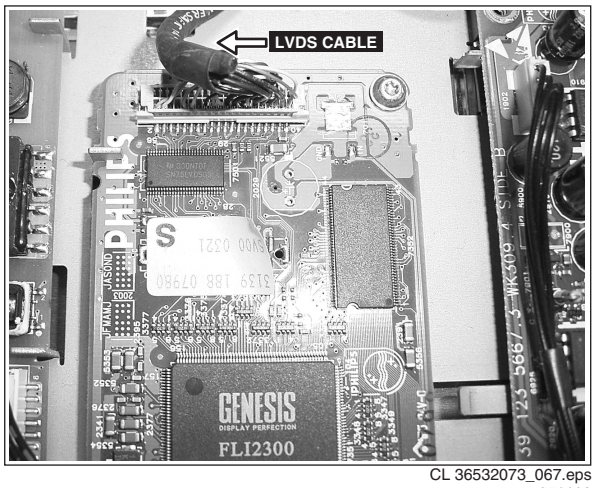

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Figure 4-11 Scaler PWB

Note: Sometimes it is necessary to place the Scaler board in a service position. In this case, it is necessary to use the specific “Repair kit scaler board” including two extra long cables (order nr. 3122 785 90490).

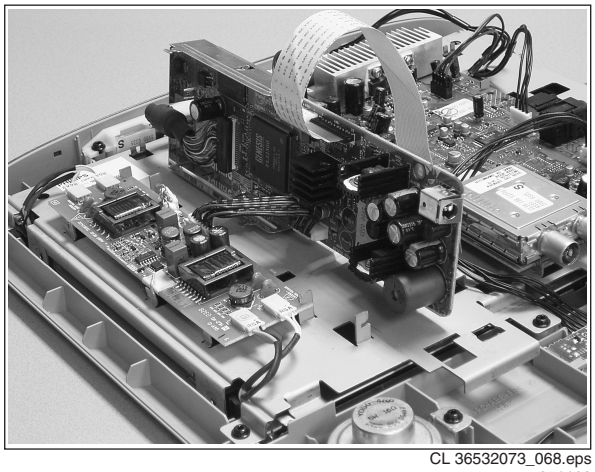

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Figure 4-12 Service position Scaler Board

Important: Video converter chip heat sink.

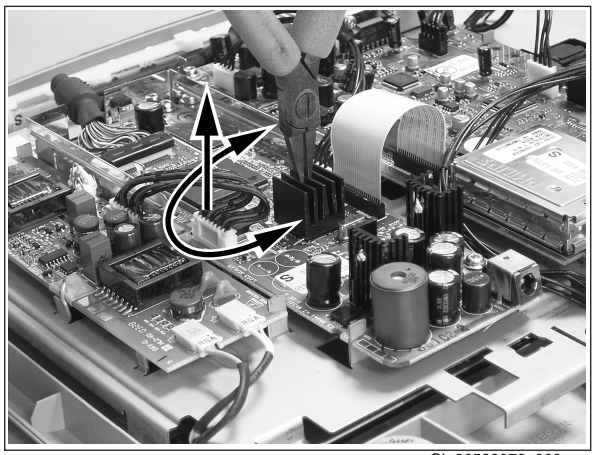

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Figure 4-13 Heat sink removal

1. Use a pair of pliers to take off the heat sink by means of a twist- and pull movement (see figure), before you de-solder the video converter chip SAA7118 from the board. Store the heat sink on a safe place, adhesive side up!
2. Place the self-adhesive heat sink back in place after the chip exchange action has been finished.

4.7 Inverter Panel Removal

1. Disconnect the 8-pole cable from the PWB.
2. Disconnect at top and bottom side all cable connectors.
3. Use a pair of pliers to bend the metal securing clamp in such a way that the PWB can be taken out.
4. Remove the Inverter PWB and store it on a safe place.

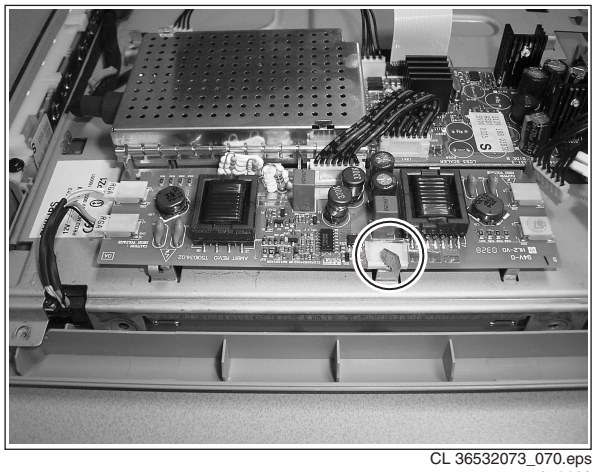

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Figure 4-14 Inverter PWB

4.8 Top Control Assy Removal

1. Remove the cable from the Top control assy (1500).
2. Remove both mounting screws that secure the unit to the monitor frame.
3. Take out the Top control assy.

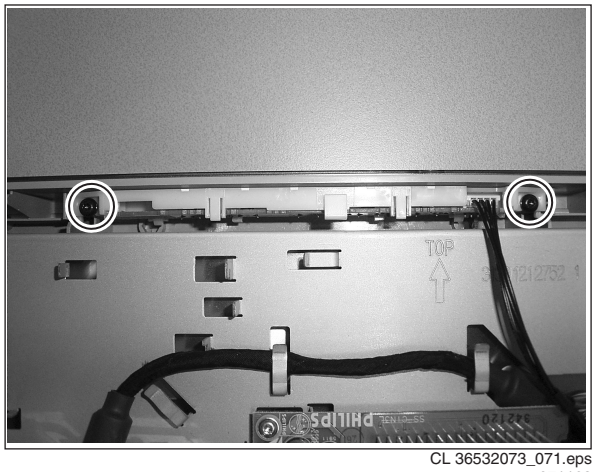

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Figure 4-15 Top control assy

4.9 LCD Panel Removal

In order to remove the LCD panel make sure that the TV board is removed. See previous paragraph(s).

1. Carefully disconnect the LVDS or TTL cable connector, which is revealed now, from LCD panel (CN1). Take care not to damage the fragile cables.
2. Unscrew and remove all five screws of the panel frame, which secure the frame to the monitor front.
3. Take care that the tape securing the speaker cable assy is removed, or loosened.
4. Remove the LCD panel metal cover frame, the LCD panel can be removed now.

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Figure 4-16 LCD panel frame screws

4.10 Re-Assembly

To re-assemble the whole set, do all processes in reverse order.

Notes:

- Take extra care when reconnecting the inverter PWB backlight connectors (black/white/pink). Connect them properly to avoid “high voltage sparking”.

5. Service Modes, Error Messages, and Repair Tips

Index of this chapter:

5.1 Test Points

This chassis is equipped with test points in the service printing. In the schematics test points are identified with a rectangle box around Fxxx or Ixxx. On the PCB, test points are specifically mentioned in the service manual as “half moons” with a dot in the centre.

Measurements are performed under the following conditions:
- Video: colour bar signal.
- Audio: 3kHz left, 1kHz right.

5.2 Service Modes

5.2.1 Limited DST Support

This chassis does still have some limited Dealer Service Tool (DST) support. The set can be put in two service modes via the DST (RC7150, this remote is not available anymore). These are the Service Default Mode (SDM) and the Service Alignment Mode (SAM).

Installation Features Dealer
For easy installation and diagnosis, the DTS can be used. When there is no picture (to access the error code buffer via the OSD), DST can enable the functionality of displaying the contents of the entire error code buffer via the blinking LED procedure.

The dealer can use the RC7150 for programming the TV-set with presets. Ten different program tables can be programmed into the DST via a GFL or MG TV-set (downloading from the GFL or MG to the DST; see GFL or MG service manuals) or by the DST-I. For explanation of the installation features of the DST, the directions for use of the DST are recommended.

5.2.2 Service Default Mode (SDM)

Purpose of SDM:
- To provide a situation with predefined settings to get the same measurements as in this manual.
- To start the “Blinking LED” procedure.
- To have the possibility to override the 5V protection

Activating SDM:
- By transmitting the "DEFAULT" command with the RC7150 Dealer Service Tool (this works both while the set is in normal operation mode or in the SAM).
- Standard RC sequence **0-6-2-5-9-6** followed by pressing the “MENU”-button (this works both while the set is in normal operation mode or in the SAM).
- By shorting pins 5 and 6 of connector 1170 of LED/RC panel. Then apply DC supply from the AC-DC adaptor (not required to remove the metal shielding).

Note: By temporarily shorting pins 5 and 6 of connector 1170 and then applying DC supply from the AC-DC adaptor, the 5V protection is disabled.

Caution: Overriding the 5V protection should only be used for a short period of time. In case of S/W protections (error 4) the set will shutdown after 15 sec.

For recognition, “SDM” is displayed at the upper right corner of the screen.

SDM Menu

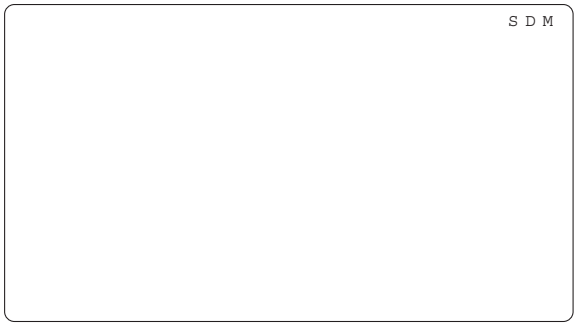

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Figure 5-1 SDM Menu

Deactivating SDM:
- Press the “EXIT”-button on the DST, or
- Press 0-0 on the standard RC, or
- Switch the set to Standby (the error buffer is NOT cleared).

Note: When the mains power is switched off while the set is in SDM, the set will switch to SDM immediately when the mains is switched on again.

The SDM sets the following pre-defined conditions:
- PAL/SECAM sets: tuning at 475.25 MHz PAL.
- Volume level is set to 25% (of the maximum volume level). Other picture and sound settings are set to 50%.

The following functions are switched off in SDM (and after leaving SDM):
- Timer.
- Sleep timer.

The following functions are disabled during SDM (and enabled after leaving SDM)
- Parental lock.
- Blue mute.
- Hospitality Mode.
- No-ident Timer (normally the set is automatically switched off when no video signal (IDENT) was received for 15 minutes).

All other controls operate normally.

Special Functions SDM

Access to normal user menu
Pressing the “MENU” button on the remote control switches between the SDM and the normal user menus (with the SDM mode still active in the background).

Channel search
Pressing the “P+” button of the remote control will select the next available channel in the preset list.

Type nr, Error buffer, etc
Pressing the “OSD” or “info+” button of the remote control shows/hides the type nr, error buffer, SW ID, Hours and option codes. OSD can be hidden to prevent interference with waveform measurements.

Access to SAM
By pressing **0-6-2-5-9-6 "info+"** (or OSD) in sequence on the standard RC will switch from SDM to SAM.

5.2.3 Service Alignment Mode (SAM)

Purpose of SAM:
- To do alignments.
- To change option settings.
- To display/clear the error code buffer values.
- To store data in NVM

Note: to store the data in SAM mode main menu.

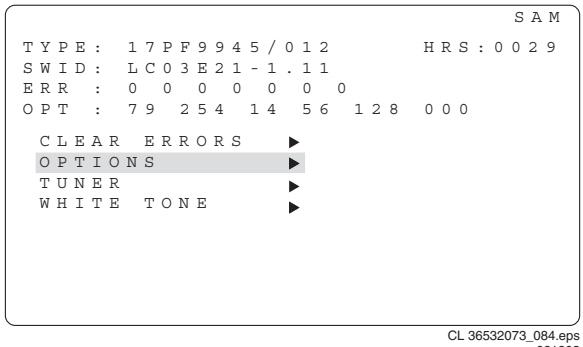
Activating SAM:
- By transmitting the "ALIGN" command with the RC7150 Dealer Service Tool (this works both while the set is in normal operation mode or in the SDM).
- Standard RC sequence **0-6-2-5-9-6** followed by pressing the "info+"-button (this works both while the set is in normal operation mode or in the SDM).

Deactivating SAM:
- Press the "EXIT"-button on the DST, or
- Press 0-0 on the standard RC, or
- Switch the set to Standby (the error buffer is NOT cleared).

Note: When the AC-DC adaptor power is switched off while the set is in SAM, the set will go back to normal mode of operation when the AC-DC adaptor is switched on again.

In SAM the following information is displayed on the screen:

SAM Menu



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021203

Figure 5-2 SAM Menu

- Operation hours timer (hexadecimal).
- Software identification of the main micro controller of TV-board (LC03BBC-X.YY).
  - LC13 is the chassis name for 4 x 3 format LCD-TV.
  - BBC is 1 letter and 2-digit combination to indicate the regional software type and the supported languages.
  - X = main version number.
  - YY= subversion number.
- Error buffer (7 errors possible).
- Option bytes (8 codes possible), summary of options are explained below.
- Sub menus are listed in a scroll-menu.

SAM Menu Control
All Menu items are:
- CLEAR ERRORS
- OPTIONS
- TUNER
- WHITE TONE
- GEOMETRY
- SOUND
- SMART SETTING

Menu items can be selected with the cursor UP/DOWN key. The selected item will be highlighted. When not all menu items fit on the screen, moving the cursor UP/DOWN will display the next/previous menu items.
With the cursor LEFT "<" / RIGHT ">" keys, it is possible to:
- Activate the selected menu item (e.g. GEOMETRY).
- Change the value of the selected menu item (e.g. HOR.SHIFT).
- Activate the selected submenu (e.g. ASBY ON/OFF).
- To return to the main menu / previous menu, press "MENU" keys on the remote control

Access to Normal User Menu
Pressing the "MENU" button on the remote control switches between the SAM and the normal user menus (with the SAM mode still active in the background). Pressing the "MENU" key in a submenu will go to the previous menu.

Menus and Submenus
CLEAR ERRORS: Erasing the contents of the error buffer. Select the CLEAR ERRORS menu item and press the MENU RIGHT key. The content of the error buffer is cleared.

The functionality of the OPTIONS and ALIGNMENTS (TUNER, WHITE TONE, GEOMETRY, SOUND and SMART SETTING) sub menus are described in chapter 8.

5.2.4 Customer Service Mode (CSM)

This chassis is equipped with the "Customer Service Mode". CSM is a special service mode that can be activated and deactivated by the customer, upon request of the service technician/dealer during a telephone conversation in order to identify the status of the set. This CSM is a 'read only' mode therefore modifications in this mode are not possible.

Activating Customer Service Mode.
The Customer Service Mode can be switched on:
- By pressing RC button is sequence "**1-2-3-6-5-4**" or,
- By pressing simultaneously the MUTE button on the remote control and any key on the TV control buttons (P+, P-, VOL +, VOL -) for at least 4 seconds.

When the CSM is activated:
- Picture and sound settings are set to nominal levels.
- Modes that interfere with the behaviour of the set are switched off (sleep timer, auto standby, etc.).
- Pressing cursor DOWN "v" on the RC will switch to CSM2 screen if it is in CSM1 screen. Likewise pressing cursor UP "^" will switch to previous CSM1 screen.
- Pressing "P+" or "P-" on RC will select next available channel to be displayed.
- Pressing channel numeric keys on RC will select the desired channel to be displayed.

Deactivating Customer Service Mode.
The Customer Service Mode will be switched off after:
- Pressing any key on the remote control handset (except numeric keys, "P+", "P-" and cursor up/down)
- Switching off the TV set with the mains switch.

All settings that were changed during activation of CSM are restored to the initial values.

Customer Service Mode Information Screen
After activating the Customer Service Mode the following screen will appear.

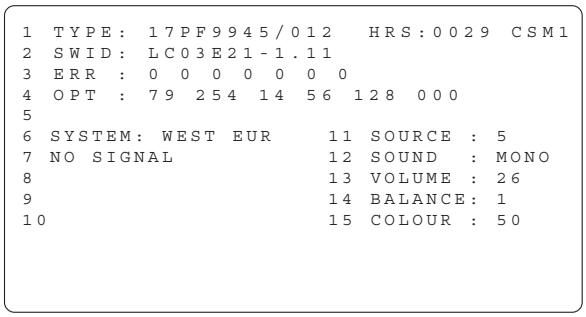

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Figure 5-3 CSM 1

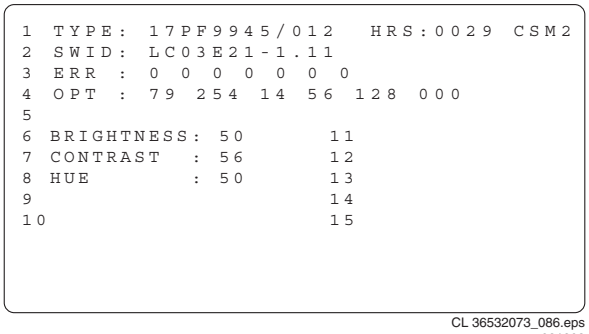

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Figure 5-4 CSM 2

The Customer Service Menu (CSM1) shows the following information:

- **Line 1: "TYPE: 99XX9999/99XHRS: nnnn"**. TYPE: type-version/model of the set (i.e. 17PF9945/12). HRS: Hexadecimal counter of operating hours. (Standby hours are counted as operating hours).
- **Line 2: "SWID: AAAABBC-X.YY"**: (Software identification of the main micro controller on TV-Board) See paragraph "Service Alignment Mode (SAM)". Details on available software versions can be found in the chapter "Software Survey" of the publication "Product Survey - Colour Television".
- **Line 3: "CODES: xx xx xx xx xx xx xx "**. Error code buffer (see paragraph "Errors"). Displays the last 7 errors of the error code buffer.
- **Line 4: "OPT xxx xxx xxx xxx xxx xxx xxx"**. Option bytes. Option bits control the software and hardware functionality of the chassis. An option byte or option number represents 8 of those bits. Each option number is displayed as a decimal number between 0 and 255. The set may not work correctly when an incorrect option code is set. See chapter 8 for more information on correct option settings
- **Line 6: "SYSTEM: EUROPE/WEST EUR/EAST EUR/UK/ FRANCE"**. Indicates which colour and sound system is installed for this preset as defined in the Manual INSTALL menu:
  - PAL BG
  - PAL I
  - PAL DK
  - SECAM BG
  - SECAM DK
  - SECAM LL'
- **Line 7: "NO SIGNAL"**. Indicates that the set is not receiving an "ident" signal on the selected source.
  - No or bad antenna signal; connect a proper antenna signal
  - Antenna not connected; connect the antenna
  - No channel / preset is stored at this program number; go to the INSTALL menu and store a proper channel at this program number
  - The tuner is faulty (in this case the CODES line will contain number 13); check the tuner and replace/repair if necessary

Note: On some models, BLUE MUTE is displayed (if the BM option is ON) when no signal is received.

- **Line 11: "SOURCE"**. Indicates which SOURCE is installed for this preset: EXT1, SVHS2, EXT2, or Tuner.
- **Line 12: "SOUND":** Indicates which sound mode is installed for this preset: Mono, NICAM, Stereo, L1, L2, SAP, Virtual, or Digital.
- **Line 13: "VOLUME":** Value indicates level at entry CSM.
- **Line 14: "BALANCE":** Value indicates level at entry CSM.
- **Line 15: "COLOUR":** Value indicates level at entry CSM.

The next Customer Service Menu (CSM2) shows the following information:

- Line 6: **"BRIGHTNESS":** Value indicates level at entry CSM.
- Line 7: **"CONTRAST":** Value indicates level at entry CSM.
- Line 8: **"HUE":** Value indicates level at entry CSM.

5.3 Errors

5.3.1 Error code buffer

The error code buffer contains all errors detected since the last time the buffer was erased. The buffer is written from left to right. When an error occurs that is not yet in the error code buffer, the error is written at the left side and all other errors shift one position to the right.

The error code buffer will be cleared in the following cases:

- By activating the CLEAR ERRORS function in SAM menu.
- By transmitting 0-6-2-5-9-9 with the normal RC.
- By transmitting the commands "DIAGNOSE 99 OK" with the DST (RC7150) or with ComPair.
- Automatically reset if its contents has not changed for 50 hours.

By leaving SDM or SAM with the mains switch, the error buffer is not reset.

Examples:
ERROR: 0 0 0 0 0 0 0 : No errors detected
ERROR: 6 0 0 0 0 0 0 : Error code 6 is the last and only detected error
ERROR: 9 6 0 0 0 0 0 : Error code 6 was first detected and error code 9 is the last detected (newest) error

The contents of the error buffer can also be made visible through the "blinking LED" procedure. This is especially useful when there is no picture. See paragraph 5.4 "The blinking LED procedure ".

5.3.2 Error codes

In case of non-intermittent faults, clear the error buffer before starting the repair, to prevent that "old" error codes are present (it is wise to write down the content of the error buffer before you clear it). If possible check the entire content of the error buffers. In some situations an error code is only the result of another error code (and not the actual cause).
Note: a fault in the protection detection circuitry can also lead to a protection.

Table 5-1 Error Codes

Error code	Error description	Possible defective components	Diagram
0	No error detected	-	----
1	Reserved		
2	Reserved		
3	Reserved		
4	5V protection active	IC7620 & 1100 I2C devices(MSP34XX & Tuner)	A3, A8, A10
5	Reserved		
6	General I2C bus error	I2C bus s/c or o/c	
7	Reserved		
8	BOCMA I2C error	IC 7301 (IF Video TDA888XX)	A4
9	BOCMA 8V supply failure	IC 7910 or IC7301(MC34063A or TDA888XX)	A4, A10
10	NVM I2C error	IC 7066 (NVM M24CXX)	A1
11	NVM identification failure	IC 7066 (NVM M24CXX)	A1
12	uProcessor internal RAM test failure	IC 7064 (uP SAA56XX)	A1
13	Tuner I2C error	1100 - UR13XX (Tuner)	A3
14	Sound processor I2C error	IC 7620 (MSP34XX)	A8
15	SRAM error	IC 7070 (RAM 128 x 8)	A2
16	Video Formatter/Scaler I2C error	IC 7351 (Farouja_s2300)(Video Converter)	C5
17	Multi-Video Decoder I2C error	IC 7302 (Video Decoder SAA7118)	C3
18*	Reserved		
19*	Reserved		
20*	Reserved		
21	SDRAM protection active	IC 7352 (SDRAM 2M x 32)	C5
*= Not application			

TV-Board

Errors

- **Error 0** = No error
- **Error 4** = +5V protection. 5V protection active; set is switched to protection; error code 4 is placed in the error buffer; the LED will blink 4 times (repeatedly). A 5V failure can be caused by a drop in the 5V supply output, resulting in an undefined behaviour of the set. Therefore, all I2C devices connected to the 5V supply are constantly monitored. When none of these devices responds to the micro controller for a prolonged time, the micro controller assumes that there is a failure in the 5V supply. By starting up the set with the service jumpers shorted, the 5V protection is disabled and it is easier to determine the cause. +5V protection will be activated when these I2C devices fail (no I2C communication):
  - Main Tuner 1100 (diagram A3)
  - ITT sound processor MSP34xx IC-7620 (diagram A8)
    Service tips: To isolate the problem area after overriding the +5V protection, determine whether:
    1. The +5V source is working properly IC7930 (diagram A10)
    2. ITT sound processor circuit is loading the +5V; isolate coil 5620 (diagram A8)
    3. The audio delay IC 7601 - IC7605 is loading the +5V source; isolate coil 5601 (diagram A7)
    4. Main tuner circuit is loading the +5V source; isolate coil 5122 (diagram A3)

    Caution: Overriding the 5V protection when there is a 5V failure can increase the temperature in the set and may cause permanent damage to components. Do not override the 5V protection for a prolonged time.
- **Error 6** = General I2C error. This will occur in the following cases:
  - SCL or SDA is shorted to ground
  - SCL is shorted to SDA
  - SDA or SCL connection at the micro controller is open circuit.
- **Error 8** = BOCMA IC TDA888xx (diagram A4) I2C communication failure. BOCMA (IC7301 on TV board) is corrupted or the I2C line to the BOCMA is low or no supply voltage present at pin 14 (3V3) or no supply voltage at pin 23.
- **Error 9** = BOCMA IC TDA888xx 8V failure (SUP bit). No supply voltage at pin 53. Check coil 5302.
- **Error 10** = NVM I2C error (diagram A1). NVM (EEPROM - IC7066) does not respond to the micro controller.
- **Error 11** = Micro controller / NV Memory identification error. During the last start-up the NVM and the micro controller did not recognize each other (e.g. one of them was replaced or the NVM memory has been changed/ adapted or lost), therefore the NVM was loaded with default values.
- **Error 12** = Microprocessor (Painter - IC 7064) internal RAM test failure.
- **Error 13** =Main Tuner I2C failure UR13xx. Tuner (item 1100, diagram A3) is corrupted or the I2C line to the tuner is low or no supply voltage at pin 3, pin 6 or 7 of the tuner.
- **Error 14** =Sound processor I2C error IC7620 (MSP34xx, diagram A8). Sound controller does not respond to the micro controller.
- **Error 15** =SRAM IC CY7C1019 test failure (IC7070, diagram A2).
  Note: Only for Europe and AP-PAL execution.

Scaler Board

When the TV detects critical errors from the Scaler board, it will shutdown into protection mode. After a short period of time, the LED will blink according to the respective error codes.

Protection errors:

- **Error 16** = Video formatter/converter I2C error IC7351 (GENESIS FLI2300, diagram C5).
- **Error 17** = Video decoder I2C error IC7302 (Philips SAA7118E, diagram C3).
  Note: BGA IC fixed with a heat sink (see chapter 4 how to remove).

5.4 The “Blinking LED” procedure

The contents of the error buffer can also be made visible through the “Blinking LED” procedure. This is especially useful when there is no picture.

When the SDM is entered, the LED will blink the contents of the error-buffer. Error-codes ≥ 10 are shown by a long blink of 750msec, which is an indication of the decimal digit, followed by a pause of 1500msec. followed by n short blinks. When all the error-codes are displayed, the sequence is finished with a LED display of 3 seconds. The sequence starts again.

Example:
Error code position 1 2 3 4 5
Error buffer: 12 9 6 0 0
This gives after activating SDM: 1 long blink of 750msec + pause of 1500msec + 2 short blinks - pause of 3 s - 9 short blinks - pause of 3 s - 6 short blinks - pause of 3 s - long blink of 3 s - etc.

Note: If errors 1, 2 or 4 occur, the LED **always** blinks the last occurred error, even if the set is **not** in service mode.

Another method of reading out a single error code is to use a standard RC or a DST.
- Standard RC - Press “0-6-2-5-0-x” in sequence, to read (blinking LED) out a respective error code in the error buffer, where x = 1, 2, 3, 4, 5, 6, or 7.
- DST: Press “Diagnose” “x” “OK” to read (blinking LED) out a respective error code in the error buffer, where x = 1, 2, 3, 4, 5, 6, or 7.

5.5 ComPair

5.5.1 Introduction

ComPair (Computer Aided Repair) is a service tool for Philips Consumer Electronics products. ComPair is a further development on the European DST (service remote control), which allows faster and more accurate diagnostics. ComPair has three big advantages:
ComPair helps you to quickly get an understanding on how to repair the chassis in a short time by guiding you systematically through the repair procedures.
ComPair allows very detailed diagnostics (on I2C level) and is therefore capable of accurately indicating problem areas. You do not have to know anything about I2C commands yourself because ComPair takes care of this.
ComPair speeds up the repair time since it can automatically communicate with the chassis (when the microprocessor is working) and all repair information is directly available. When ComPair is installed together with the SearchMan electronic manual of the defective chassis, schematics and PWBs are only a mouse click away.

5.5.2 Specifications

ComPair consists of a Windows based faultfinding program and an interface box between PC and the (defective) product. The ComPair interface box is connected to the PC via a serial or RS232 cable.
The ComPair faultfinding program is able to determine the problem of the defective television. ComPair can gather diagnostic information in two ways:
- **Automatic** (by communication with the television): ComPair can automatically read out the contents of the entire error buffer. Diagnosis is done on I2C level. ComPair can access the I2C bus of the television. ComPair can send and receive I2C commands to the micro controller of the television. In this way, it is possible for ComPair to communicate (read and write) to devices on the I2C busses of the TV-set.
- **Manually** (by asking questions to you): Automatic diagnosis is only possible if the micro controller of the television is working correctly and only to a certain extend. When this is not the case, ComPair will guide you through the faultfinding tree by asking you questions (e.g. *Does the screen give a picture? Click on the correct answer: YES / NO*) and showing you examples (e.g. *Measure test-point I7 and click on the correct waveform you see on the oscilloscope*). You can answer by clicking on a link (e.g. text or a waveform picture) that will bring you to the next step in the faultfinding process.

By a combination of automatic diagnostics and an interactive question / answer procedure, ComPair will enable you to find most problems in a fast and effective way.

Beside fault finding, ComPair provides some **additional features** like:
- Up- or downloading of pre-sets.
- Managing of pre-set lists.
- Emulation of the Dealer Service Tool (DST).
- If both ComPair and SearchMan (Electronic Service Manual) are installed, all the schematics and the PWBs of the set are available by clicking on the appropriate hyperlink.
  Example: *Measure the DC-voltage on capacitor C2568 (Schematic/Panel) at the Mono-carrier*.
  – Click on the 'Panel' hyperlink to automatically show the PWB with a highlighted capacitor C2568.
  – Click on the 'Schematic' hyperlink to automatically show the position of the highlighted capacitor.

5.5.3 How To Connect

1. First, install the ComPair Browser software (see the Quick Reference Card for installation instructions).
2. Connect the RS232 interface cable between a free serial (COM) port of your PC and the PC connector (marked with 'PC') of the ComPair interface.
3. Connect the mains adapter to the supply connector (marked with 'POWER 9V DC') of the ComPair interface.
4. Switch the ComPair interface “off”.
5. Switch the television set “off” with the mains switch.
6. Connect the ComPair interface cable between the connector on the rear side of the ComPair interface (marked with 'I2C') and the ComPair connector at the rear side of the TV (situated just below the tuner input, see also chapter 4).
7. Plug the mains adapter in a mains outlet, and switch the interface “on”. The green and red LEDs light up together. The red LED extinguishes after approx. 1 second while the green LED remains lit.
8. Start the ComPair program and read the 'Introduction' chapter.

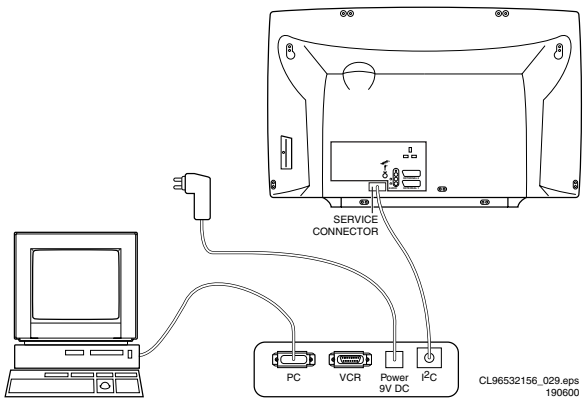


Figure 5-5 ComPair Interface connection

5.5.4 How To Order

ComPair order codes (EU/AP/LATAM):
- Starter kit ComPair32/SearchMan32 software and ComPair interface (excl. transformer): 3122 785 90450.
- ComPair interface (excluding transformer): 4822 727 21631.
- Starter kit ComPair32 software (registration version): 3122 785 60040.
- Starter kit SearchMan32 software: 3122 785 60050.
- ComPair32 CD (update): 3122 785 60070 (year 2002, 3122 785 60110 (year 2003).
- SearchMan32 CD (update): 3122 785 60080 (year 2002), 3122 785 60120 (year 2003).
- ComPair interface cable: 3122 785 90004.
- ComPair firmware upgrade IC: 3122 785 90510 (only for sets with software upgrade facilities).
- Transformer (non-UK): 4822 727 21632.
- Transformer UK: 4822 727 21633.

Note: If you encounter any problems, contact your local support desk.

5.6 Trouble Shooting Tips

5.6.1 Scaler/TV Board Power Supply Problems

In this paragraph some troubleshooting steps for checking the power supply of the Scaler-board and TV-board circuitry are described.

- Measure across pin-1 and pin-4 of connector 1003 (diagram C1). +12V (13" and 15") or +24V (20") should be present. If the voltage is not present, probably is caused by:
  - AC to DC adaptor is defect.
  - Short circuit in TV-board (can be isolated by connector 1003).
  - Fuse 1002 is open circuit.
- Measure across C2923 (diagram A10). +3V3 should be present. If not present, probably this is caused by:
  - IC7920 is defective.
  - R3925 is defective.
  - The power supply circuit (diagram C1) is defective (see Scaler-board circuit trouble shooting tips).
- Measure across C2913/C2933 (diagram A10). +8V3/+5V4 should be present respectively. If not present, probably this is caused by:
  - IC 7910/7930 regulator is defective.
  - Fuse 1903 is defective.
  - Switching FET 7900 is defective.
  - Transistor T7901 is defective.
- Measure across C2007 (diagram C1). +5V should be present. If not present, probably this is caused by:
  - +5V grounded by the load.
  - Regulator IC 7001 is defective.
  - Control transistor T7003/7002 is defective.
  - Scaler power control signal line (POW-CON-SCALER coming from TV-board) is defective.
- Measure pin-4 or pin-5 of connector 1341 (diagram C5). Pin-4 should be high (+4V7) and pin-5 also should be high (+3V4). If one/both of the voltage is not present, probably this is caused by:
  - IC 7351 (Farouja_s2300) is defective.
  - Inverter board is defective.

5.6.2 General Problems

TV switched "off" or changed channel without any user action

Set switches off after "TV SWITCHING OFF" was displayed. "Auto Standby" switched the set "off" because:
- There was no ident signal for more than 15 minutes.
- There was no remote control signal received or local key pressed for > 2 hours.

See chapter 8 for a description on the options to enable/disable "Auto Standby".

5.6.3 Picture problems

Picture too dark or too bright
- Press "Smart Picture" button on the remote control. In case the picture improves, increase / decrease the brightness value or increase / decrease the contrast value. The new "Personal Preference" value is automatically stored after 3 minutes.
- After switching on the Customer Service Mode the picture is OK. Increase / decrease the brightness value or increase / decrease the contrast value. The new "Personal Preference" value is automatically stored after 3 minutes.

Snowy picture

Check the "NOT TUNED" section of the Customer Service Mode screen.

Snowy picture and/or unstable picture

A scrambled or decoded signal is received.

Black and white picture
- Press "Smart Picture" button on the remote control. In case picture improves, increase the colour value. The new "Personal Preference" value is automatically stored after 3 minutes.
- After switching on the Customer Service Mode the picture is OK. Increase the colour value. The new "Personal Preference" value is automatically stored after 3 minutes.

Menu text not sharp enough
- Press "Smart Picture" button on the remote control. In case the picture improves, decrease the contrast value. The new "Personal Preference" value is automatically stored after 3 minutes.
- After switching on the Customer Service Mode the picture is OK. Decrease the contrast value. The new "Personal Preference" value is automatically stored after 3 minutes.

5.6.4 Sound problems

No sound or sound too loud (after channel change / switching on)

After switching on the Customer Service Mode the volume is OK. Increase / decrease the volume level. The new "Personal Preference" value is automatically stored after 3 minutes.

5.6.5 Extra information/tips:

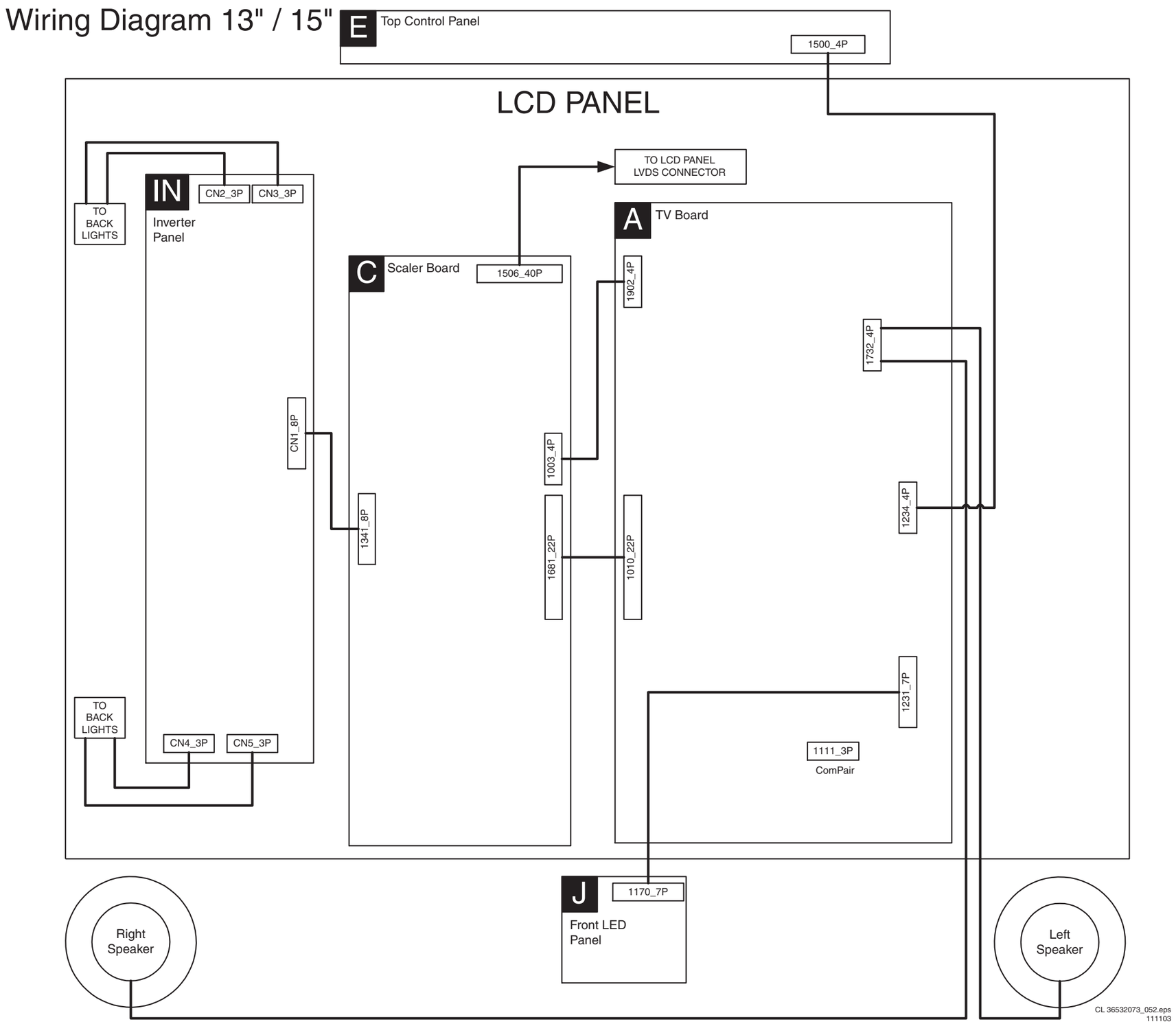
- Complaints that may be caused by an incorrect system setting:
  - No colours
  - Colours not correct
  - Unstable picture
  - Noise in picture To change the system setting of a preset:
    1. Press the "MENU" button on the remote control
    2. Select the INSTALL sub menu
    3. Select the MANUAL STORE sub menu
    4. Select and change the SYSTEM setting until picture and sound are correct
    5. Select the STORE menu item
- The Scaler is the driving engine of the LCD panel. When there is no display and OSD on screen, check whether sound is producible on TV channel. If sound is audible, most likely the defective lies in Scaler board or inverter board.

- To know fast whether inverter is functioning, visually check if the backlights are “on” by looking at the back of the LCD panel. Some bright spots can be seen on the side. Other way to tell whether the backlight is working is to switch the set to AV mode. The front of the screen had some kind of “fogged” effect.
  Note: when one of the backlight connectors has loosened, the inverter circuit will be shut down.
- If the supply to the LCD panel is OK (likewise for backlight supply), but no data signals (example: signals on connector 1506) supplied from Scaler to LCD panel, you will notice that the LCD screen will shown full screen in sequential of BLUE, GREEN, RED, BLANK, dark-GREY, light-GREY and WHITE repeatedly. It means LCD panel is in good condition. The fault lies in the Scaler board

Personal Notes:

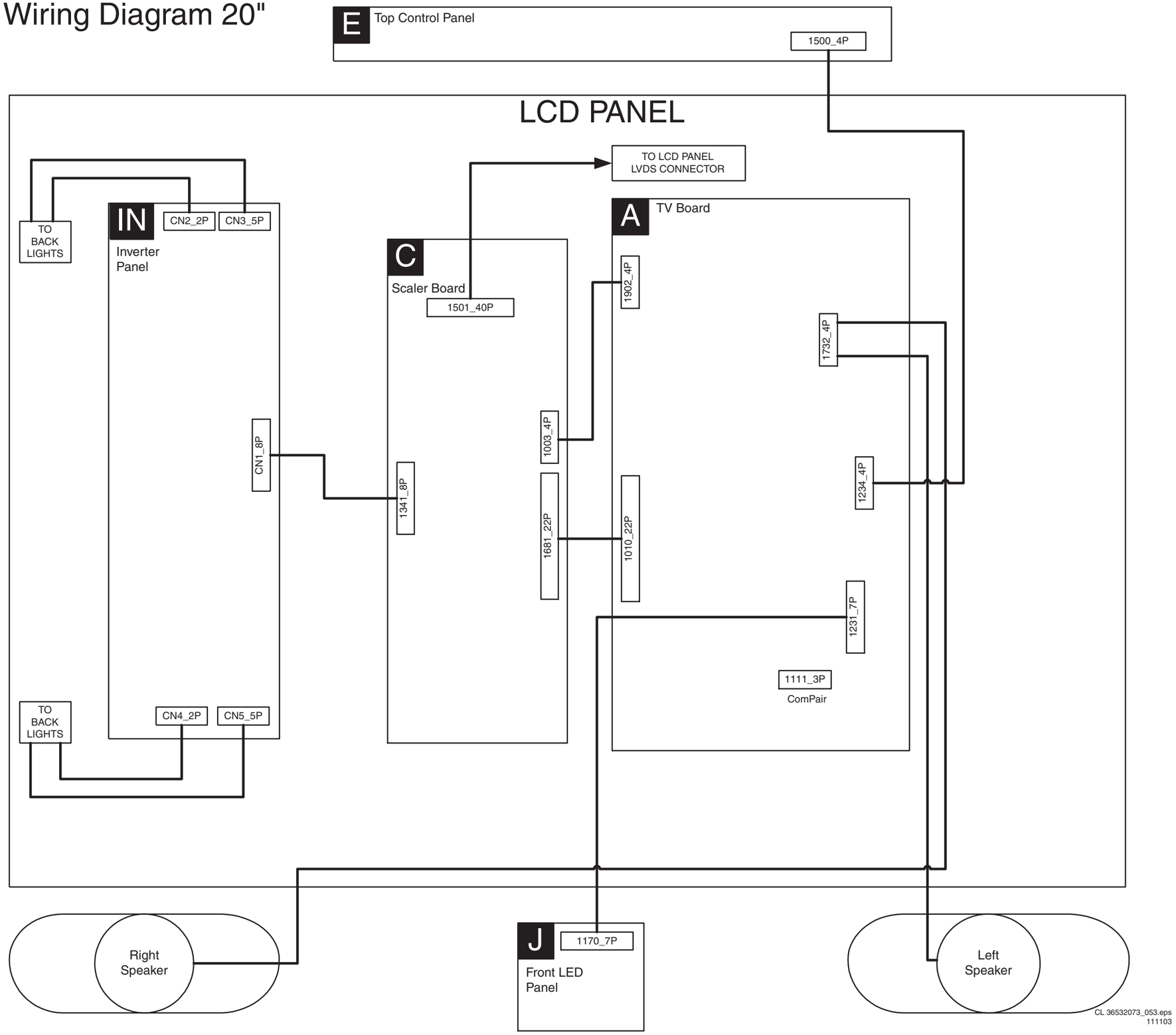
6. Block Diagrams, Testpoint Overviews, and Waveforms

Wiring Diagram (13”/15”)



Wiring Diagram 20”

Wiring Diagram 20"



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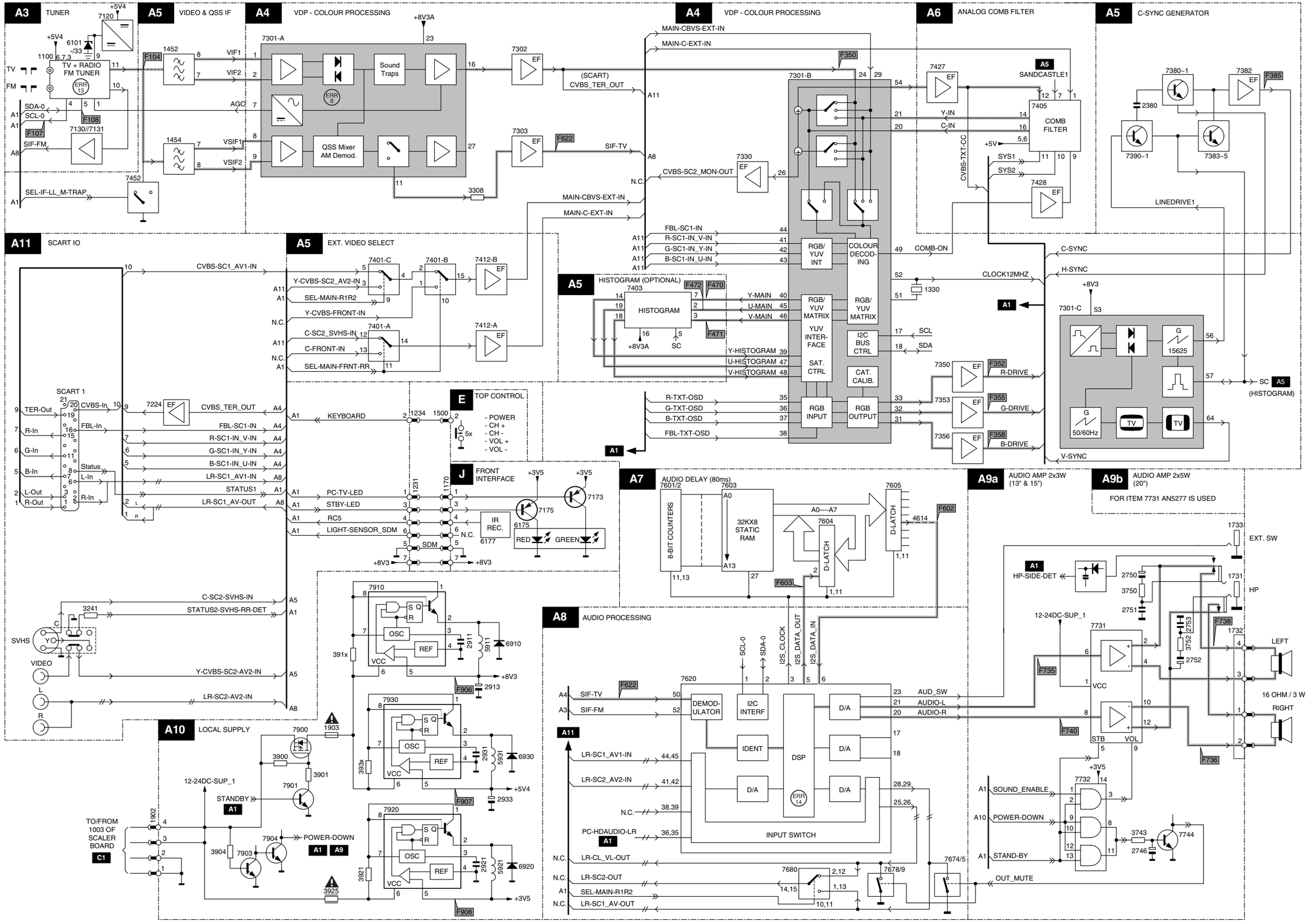
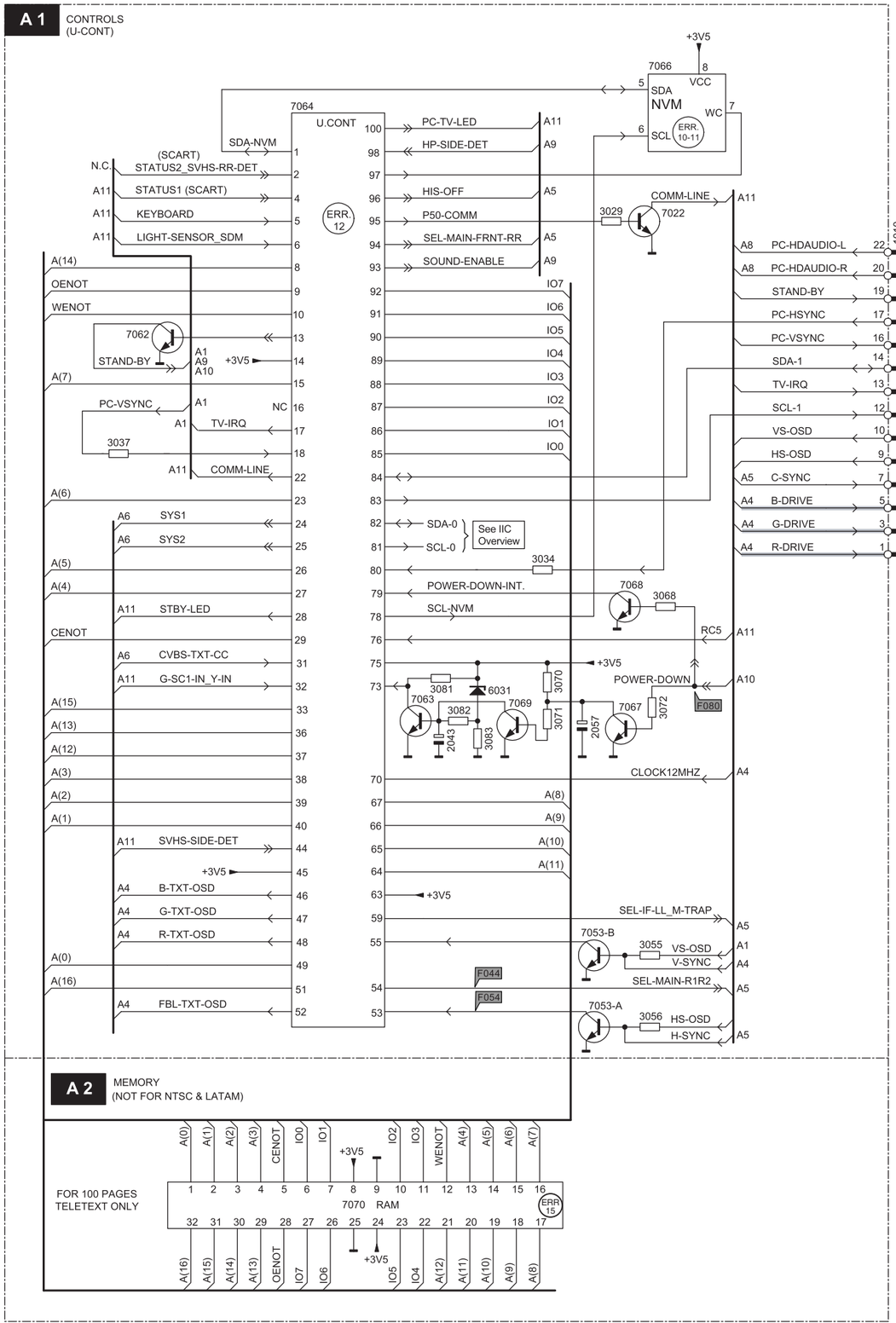
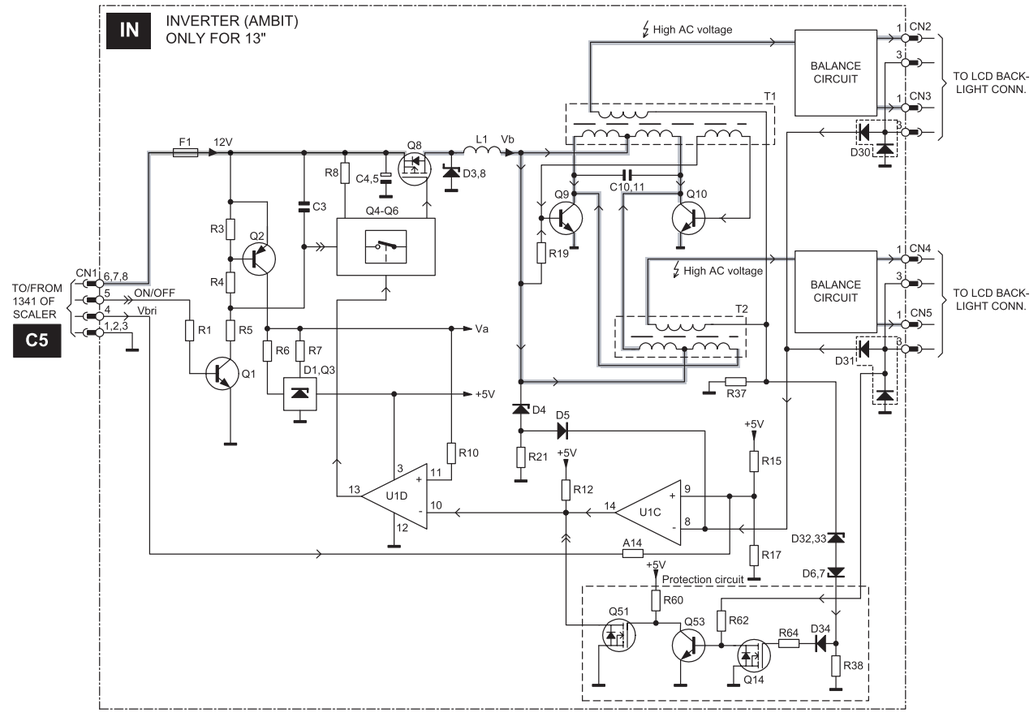
Block Diagram (Tuner-IF-Video)



Block Diagram (TV Control and Inverter Panel)





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Testpoint Overview TV Board

F002 B3
F003 B4
F004 B4
F006 B3
F007 B3
F008 B4
F010 B3
F011 B3
F012 C4
F013 B4
F014 B4
F015 C4
F022 B3
F025 C4
F032 C4
F044 B3
F045 B3
F046 B3
F054 C3
F066 B4
F068 B3
F070 A4
F071 A4
F072 A4
F073 A4
F074 A4
F075 A4
F076 A3
F077 A4
F080 B3
F085 A3
F101 B6
F102 B5
F103 B5
F104 A5
F105 A6
F106 B6
F107 B6
F108 B6
F109 B6
F201 B6
F202 B6
F203 B6
F204 B6
F205 B6
F206 C6
F207 C6
F208 C6
F210 C6
F211 C5
F212 C5
F213 C5
F214 C5
F215 C5
F216 C5
F217 C4
F218 C6
F219 C4
F221 C5
F222 C4
F223 C4
F224 C5
F225 C3
F226 C3
F227 C4
F228 C4
F230 C5
F231 C4
F234 C5
F235 C5
F236 C6
F237 C5
F238 A4
F301 B4
F302 A5
F321 A4
F337 A4
F338 A4
F339 A4
F340 A4
F341 A4
F342 B4
F345 A4
F346 B4
F349 B4
F350 B4
F351 A4
F352 A4
F355 A4
F358 A4
F385 A5
F413 B4
F426 C5
F427 C5
F428 C5
F429 B5
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F431 C5
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F471 A4
F472 B4
F473 A4
F474 B4
F476 A4
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F478 A4
F479 B4
F480 B4
F601 B1
F602 B1
F603 B1
F610 B1
F612 B1
F613 C1
F620 B2
F621 B3
F622 A3
F626 B3
F640 B3
F645 A3
F646 A3
F650 B2
F655 B2
F656 B2
F676 A3
F731 B1
F732 B2
F735 B2
F736 C2
F737 C2
F738 C2
F739 C2
F740 B2
F743 C3
F745 B1
F755 C3
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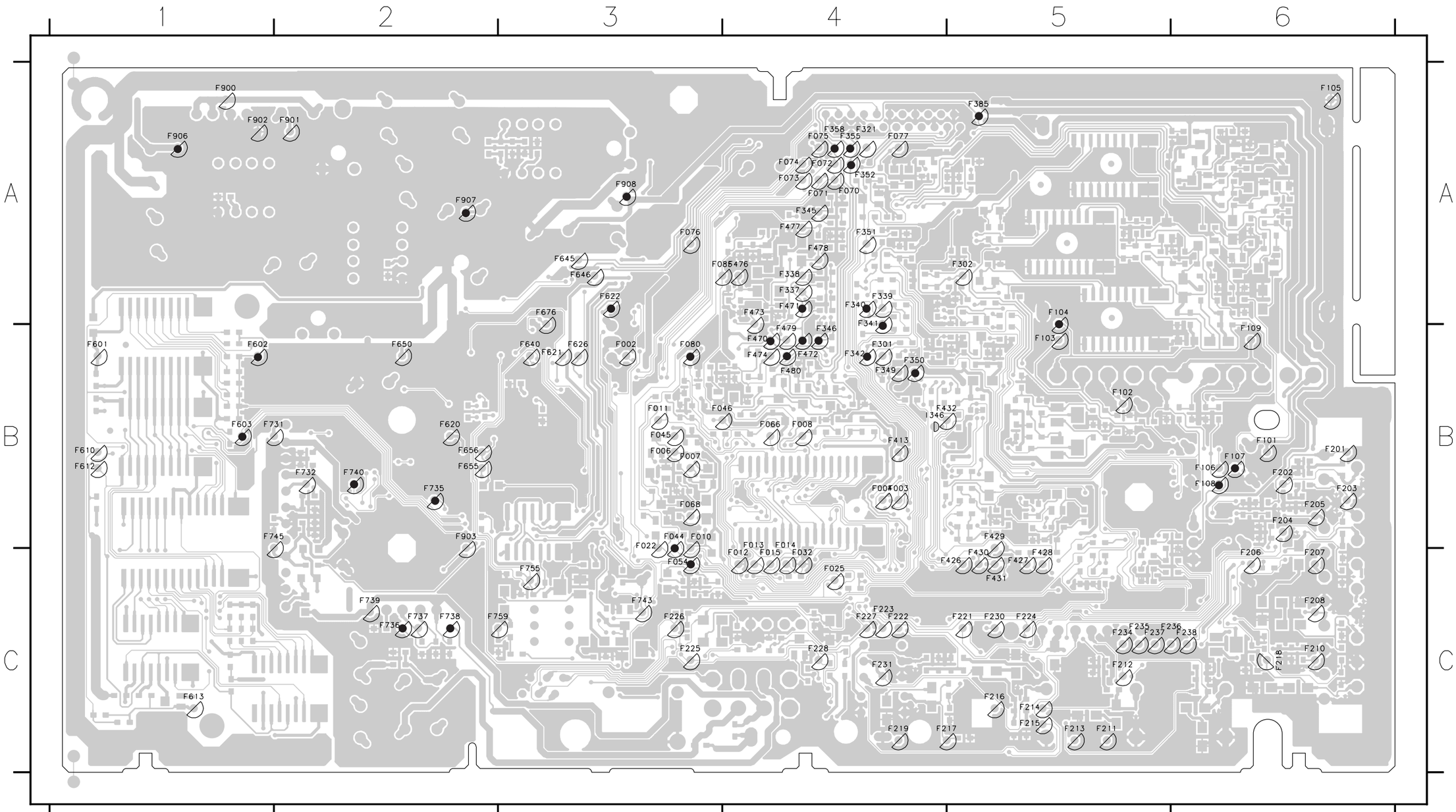
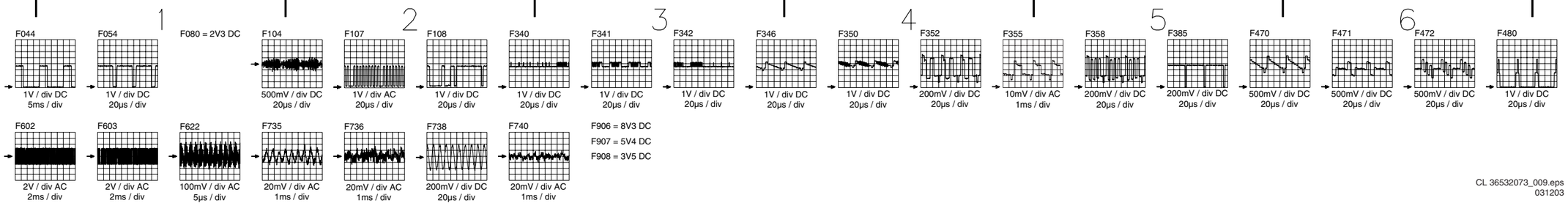
F906 A1
F907 A2
F908 A3
I346 B4





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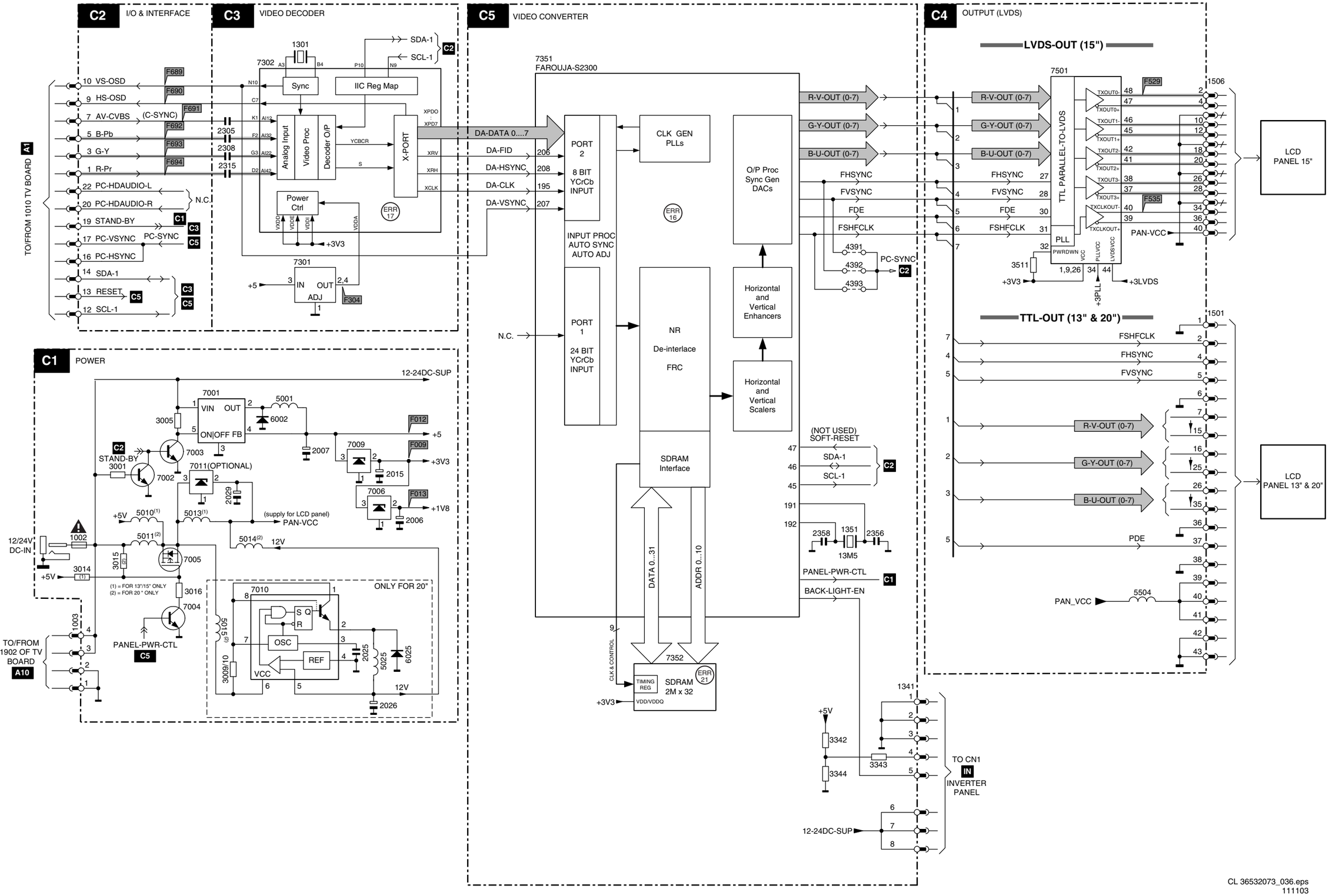
Block Diagram (Scaler Board)



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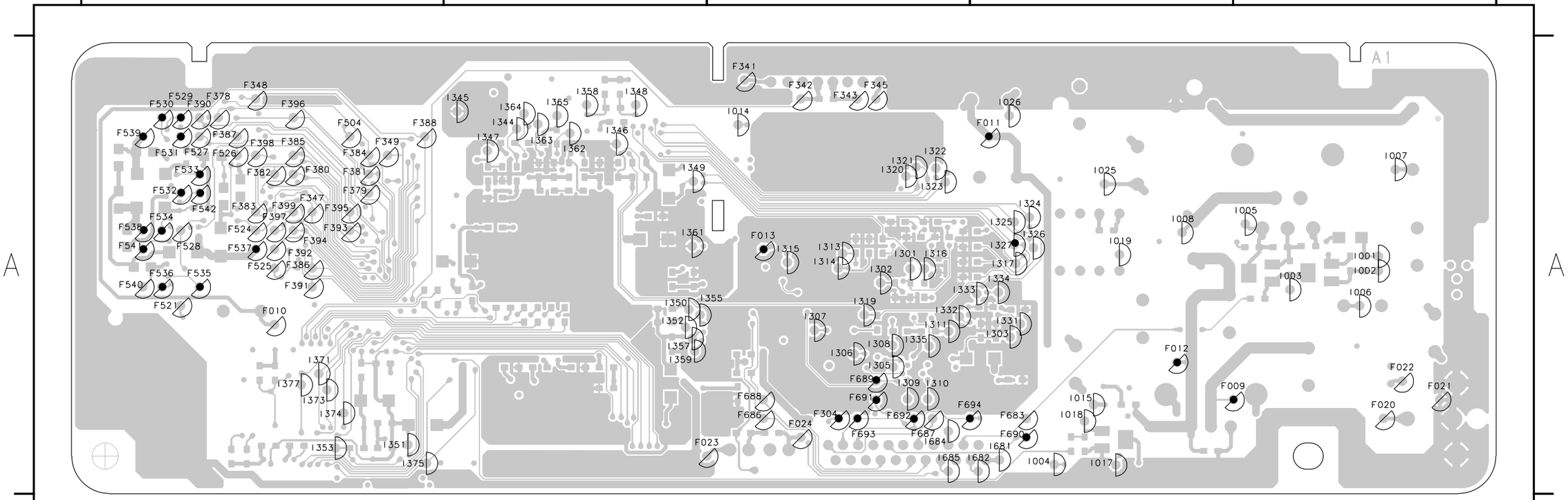
111103

Testpoint Overview Scaler Board

F009 A4	F021 A5	F342 A3	F378 A1	F384 A1	F391 A1	F397 A1	F525 A1	F531 A1	F537 A1	F683 A4	F691 A3	I003 A5	I014 A3	I026 A4	I307 A3	I314 A3	I321 A3	I327 A4	I344 A2	I350 A2	I358 A2	I365 A2	I681 A4
F010 A1	F022 A5	F343 A3	F379 A1	F385 A1	F392 A1	F398 A1	F526 A1	F532 A1	F538 A1	F686 A3	F692 A3	I004 A4	I015 A4	I301 A3	I308 A3	I315 A3	I322 A3	I331 A4	I345 A2	I351 A1	I359 A2	I371 A1	I682 A4
F011 A4	F023 A2	F345 A3	F380 A1	F386 A1	F393 A1	F399 A1	F527 A1	F533 A1	F539 A1	F687 A3	F693 A3	I005 A5	I017 A4	I302 A3	I309 A3	I316 A3	I323 A3	I332 A3	I346 A2	I352 A2	I361 A2	I373 A1	I684 A3
F012 A4	F024 A3	F347 A1	F381 A1	F387 A1	F394 A1	F504 A1	F528 A1	F534 A1	F540 A1	F688 A3	F694 A3	I006 A5	I018 A4	I303 A4	I310 A3	I317 A4	I324 A4	I333 A3	I347 A2	I353 A1	I362 A2	I374 A1	I685 A3
F013 A3	F304 A3	F348 A1	F382 A1	F388 A1	F395 A1	F521 A1	F529 A1	F535 A1	F541 A1	F689 A3	I001 A5	I007 A5	I019 A4	I305 A3	I311 A3	I319 A3	I325 A4	I334 A4	I348 A2	I355 A3	I363 A2	I375 A1	
F020 A5	F341 A3	F349 A1	F383 A1	F390 A1	F396 A1	F524 A1	F530 A1	F536 A1	F542 A1	F690 A4	I002 A5	I008 A4	I025 A4	I306 A3	I313 A3	I320 A3	I326 A4	I335 A3	I349 A2	I357 A2	I364 A2	I377 A1	



3139 123 5694.1

F009 = 3V3 DC
F011 = 12V DC
F012 = 5V DC
F013 = 1V8 DC
F304 = 3V3 DC

F529 500mV / div DC 10µs / div
F530 500mV / div DC 10µs / div
F532 500mV / div DC 10µs / div
F533 500mV / div DC 10µs / div
F534 500mV / div DC 10µs / div
F535 500mV / div DC 10µs / div
F536 500mV / div DC 10µs / div

F537 = 3V3 DC
F538 = 3V2 DC
F539 = 3V DC

F541 500mV / div DC 10µs / div
F542 500mV / div DC 10µs / div
F689 1V / div DC 5ms / div
F690 1V / div DC 20µs / div
F691 200mV / div DC 20µs / div
F692 200mV / div DC 10µs / div
F693 200mV / div DC 10µs / div
F694 200mV / div DC 10µs / div
I327 1V / div DC 2µs / div

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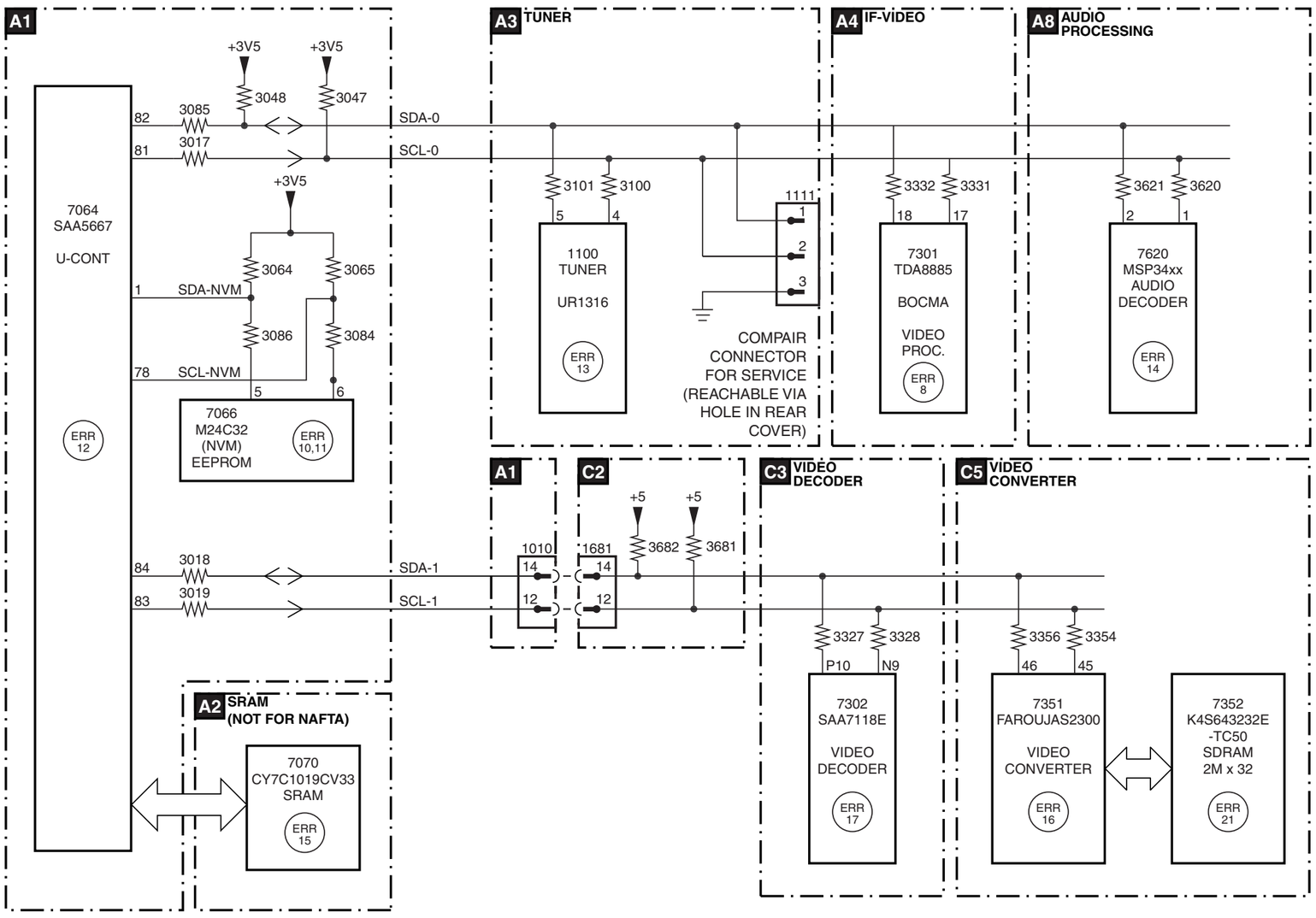
171103

I2C-IC's and Error Codes Overview

IIC



Error codes

Error code	Error description	Possible defective components	Diagram
0	No error detected	—	----
1	Reserved		
2	Reserved		
3	Reserved		
4	5V protection active	IC7620 & 1100 I2C devices (MSP34XX & Tuner)	A3, A8, A10
5	Reserved		
6	General I2C bus error	I2C bus s/c or o/c	
7	Reserved		
8	BOCMA I2C error	IC 7301 (IF Video TDA888XX)	A4
9	BOCMA 8V supply failure	IC 7910 or IC7301 (MC34063A or TDA888XX)	A4, A10
10	NVM I2C error	IC 7066 (NVM M24CXX)	A1
11	NVM identification failure	IC 7066 (NVM M24CXX)	A1
12	uProcessor internal RAM test failure	IC 7064 (uP SAA56XX)	A1
13	Tuner I2C error	1100 – UR13XX (Tuner)	A3
14	Sound processor I2C error	IC 7620 (MSP34XX)	A8
15	SRAM error	IC 7070 (RAM 128 x 8)	A2
16	Video Formatter/Scaler I2C error	IC 7351 (Farouja_s2300) (Video Converter)	C5
17	Multi-Video Decoder I2C error	IC 7302 (Video Decoder SAA7118)	C3
18*	Reserved		
19*	Reserved		
20*	Reserved		
21	SDRAM protection active	IC 7352 (SDRAM 2M x 32)	C5

*= Not application

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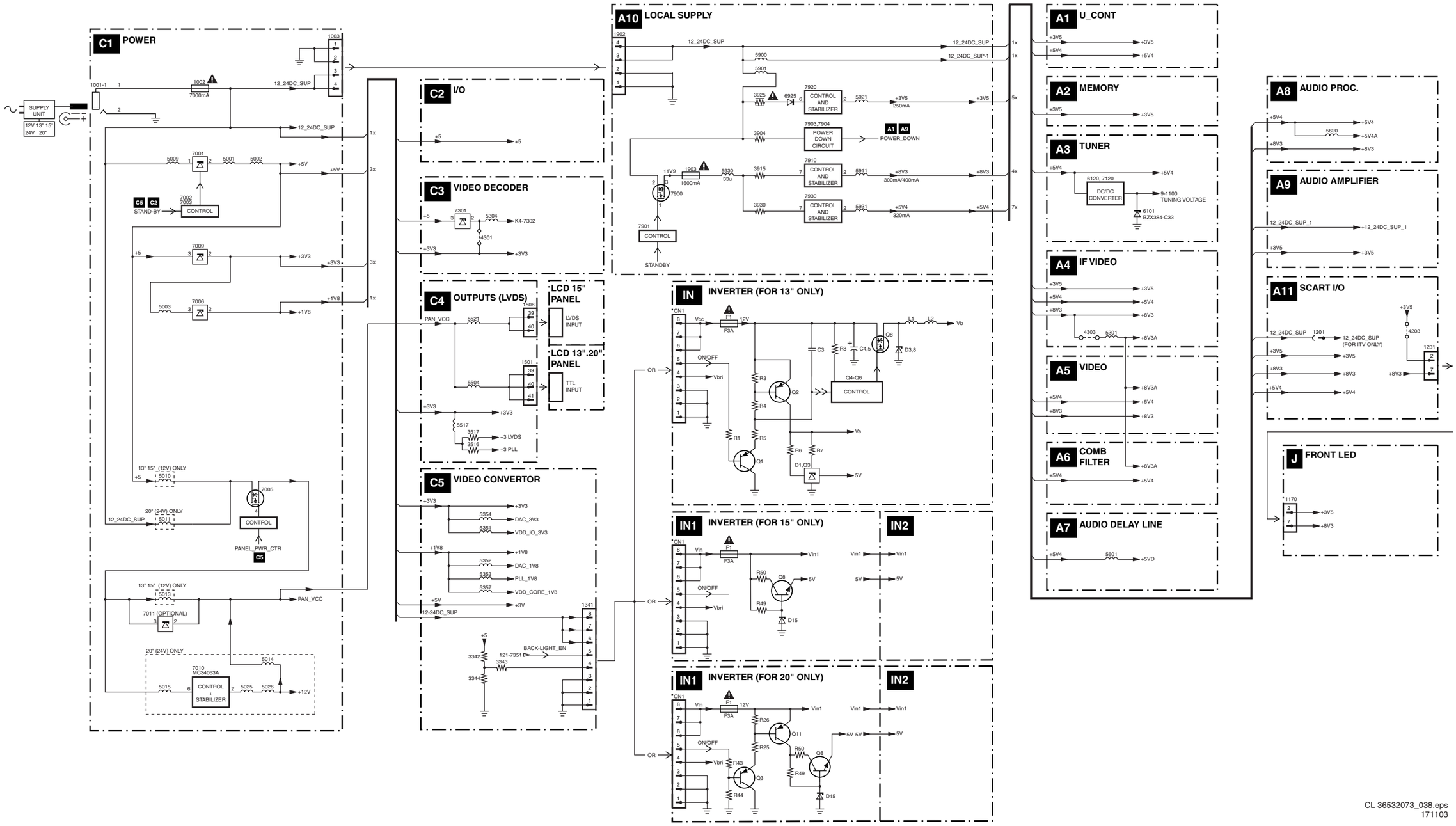
171103

Powerlines Overview



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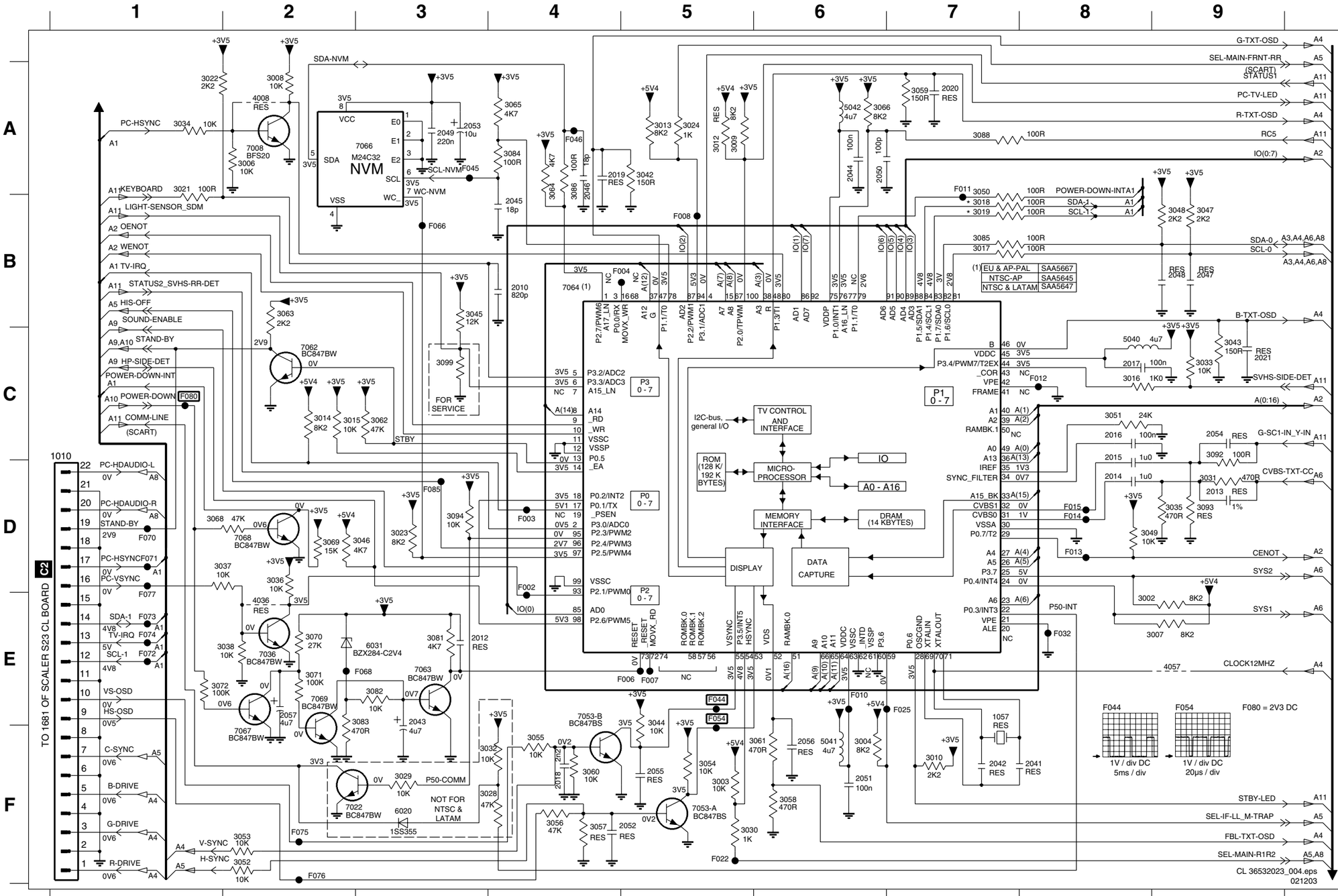
171103

7. Circuit Diagrams and PWB Layouts

TV Board: U_Cont

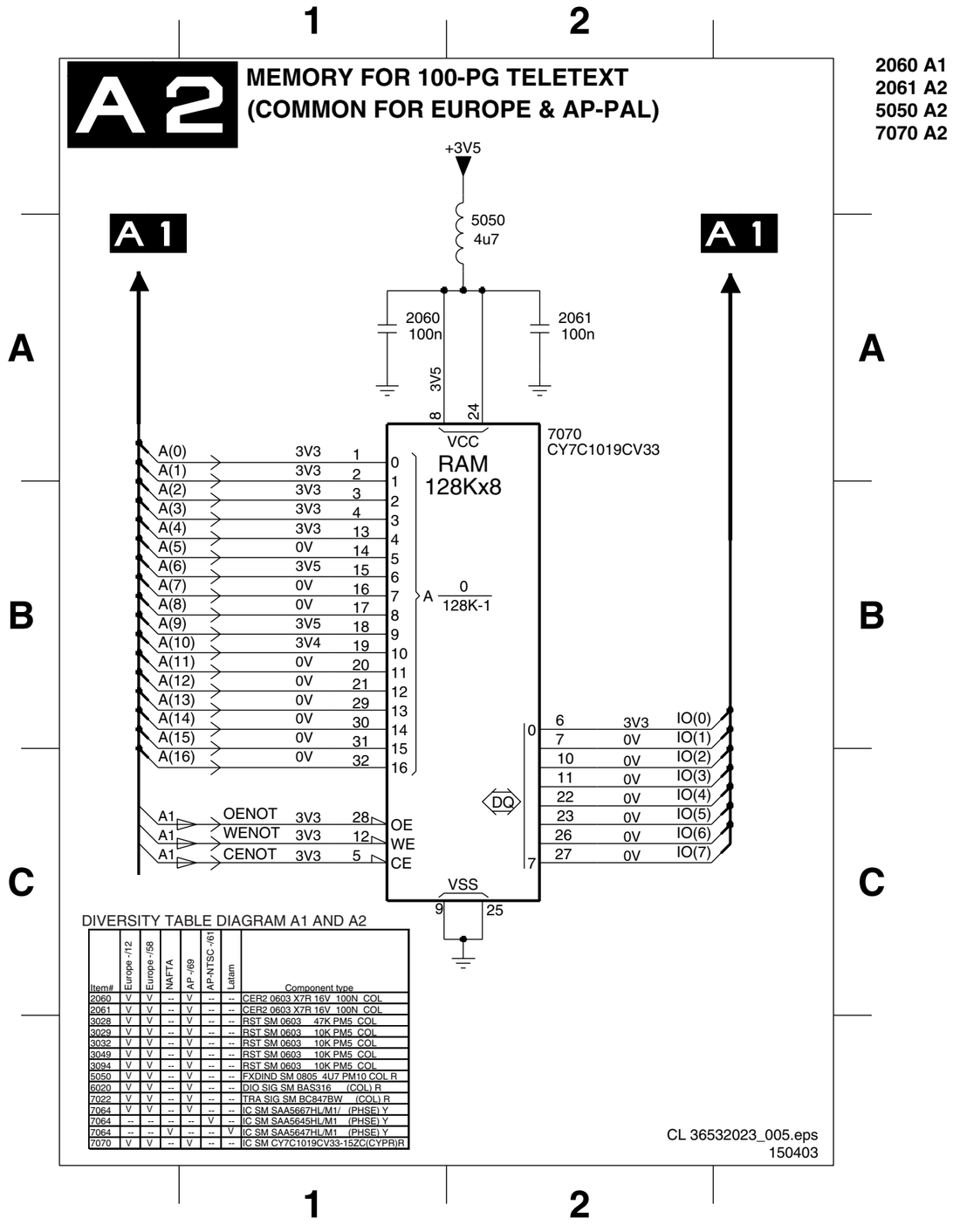
A 1 U_CONT (COMMON)

FOR DIVERSITY TABLE SEE DIAGRAM A2



1010	C1	3071	E2
1057	E7	3072	E1
2010	B4	3081	E3
2012	E3	3082	E3
2013	D9	3083	E3
2014	D8	3084	A4
2015	C8	3085	B7
2016	C8	3086	A4
2017	C8	3088	A7
2018	F4	3092	C9
2019	A4	3093	D9
2020	A7	3094	D3
2021	C9	3099	C3
2041	F8	4008	A2
2042	F7	4036	E2
2043	E3	4057	E9
2044	A6	5040	C8
2045	B4	5041	F6
2046	A4	5042	A6
2047	B9	6020	F3
2048	B9	6031	E3
2049	A3	7008	A2
2050	A6	7022	E2
2051	F6	7036	E2
2052	F5	7053-A	F5
2053	A3	7053-B	E4
2054	C9	7062	C2
2055	F5	7063	E3
2056	F6	7064	B4
2057	E2	7066	A3
3002	E8	7067	F2
3003	F5	7068	D2
3004	F6	7069	E2
3006	A2	F002	D4
3007	E9	F003	D4
3008	A2	F004	B5
3009	A5	F006	E5
3010	F7	F007	E5
3012	A5	F008	B5
3013	A5	F010	E6
3014	C2	F011	A7
3015	C2	F012	C8
3016	C8	F013	D8
3017	B7	F014	D8
3018	B7	F015	D8
3019	B7	F022	F5
3021	A1	F025	E7
3022	A1	F032	E8
3023	D3	F044	E5
3024	A5	F045	A3
3028	F4	F046	A4
3029	F3	F054	E5
3030	F5	F066	B3
3031	D9	F068	E3
3032	F4	F070	D1
3033	C9	F071	D1
3034	A1	F072	E1
3035	D9	F073	E1
3036	D2	F074	E1
3037	D2	F075	F2
3038	E2	F076	F2
3042	A5	F077	E1
3043	C9	F080	C1
3044	E5	F085	D3
3045	B3		
3046	D3		
3047	B9		
3048	B9		
3049	D8		
3050	A7		
3051	C8		
3052	F2		
3053	F2		
3054	F5		
3055	F4		
3056	F4		
3057	F4		
3058	F6		
3059	A7		
3060	F4		
3061	F6		
3062	C3		
3063	B2		
3064	A4		
3065	A4		
3066	A6		
3068	D1		
3069	D2		
3070	E2		

TV Board: Memory for 100-pg Teletext



Item#	Europe -/12	Europe -/58	NAFTA	AP -/69	AP-NTSC -/61	Latam	Component type
2060	V	V	--	V	--	--	CER2 0603 X7R 16V 100N COL
2061	V	V	--	V	--	--	CER2 0603 X7R 16V 100N COL
3028	V	V	--	V	--	--	RST SM 0603 47K PM5 COL
3029	V	V	--	V	--	--	RST SM 0603 10K PM5 COL
3032	V	V	--	V	--	--	RST SM 0603 10K PM5 COL
3049	V	V	--	V	--	--	RST SM 0603 10K PM5 COL
3094	V	V	--	V	--	--	RST SM 0603 10K PM5 COL
5050	V	V	--	V	--	--	FXDIND SM 0805 4U7 PM10 COL R
6020	V	V	--	V	--	--	DIO SIG SM BAS316 (COL) R
7022	V	V	--	V	--	--	TRA SIG SM BC847BW (COL) R
7064	V	V	--	V	--	--	IC SM SAA5667HL/M1/ (PHSE) Y
7064	--	--	--	--	V	--	IC SM SAA5645HL/M1 (PHSE) Y
7064	--	--	V	--	--	V	IC SM SAA5647HL/M1 (PHSE) Y
7070	V	V	--	V	--	--	IC SM CY7C1019CV33-15ZC(CYPR)R

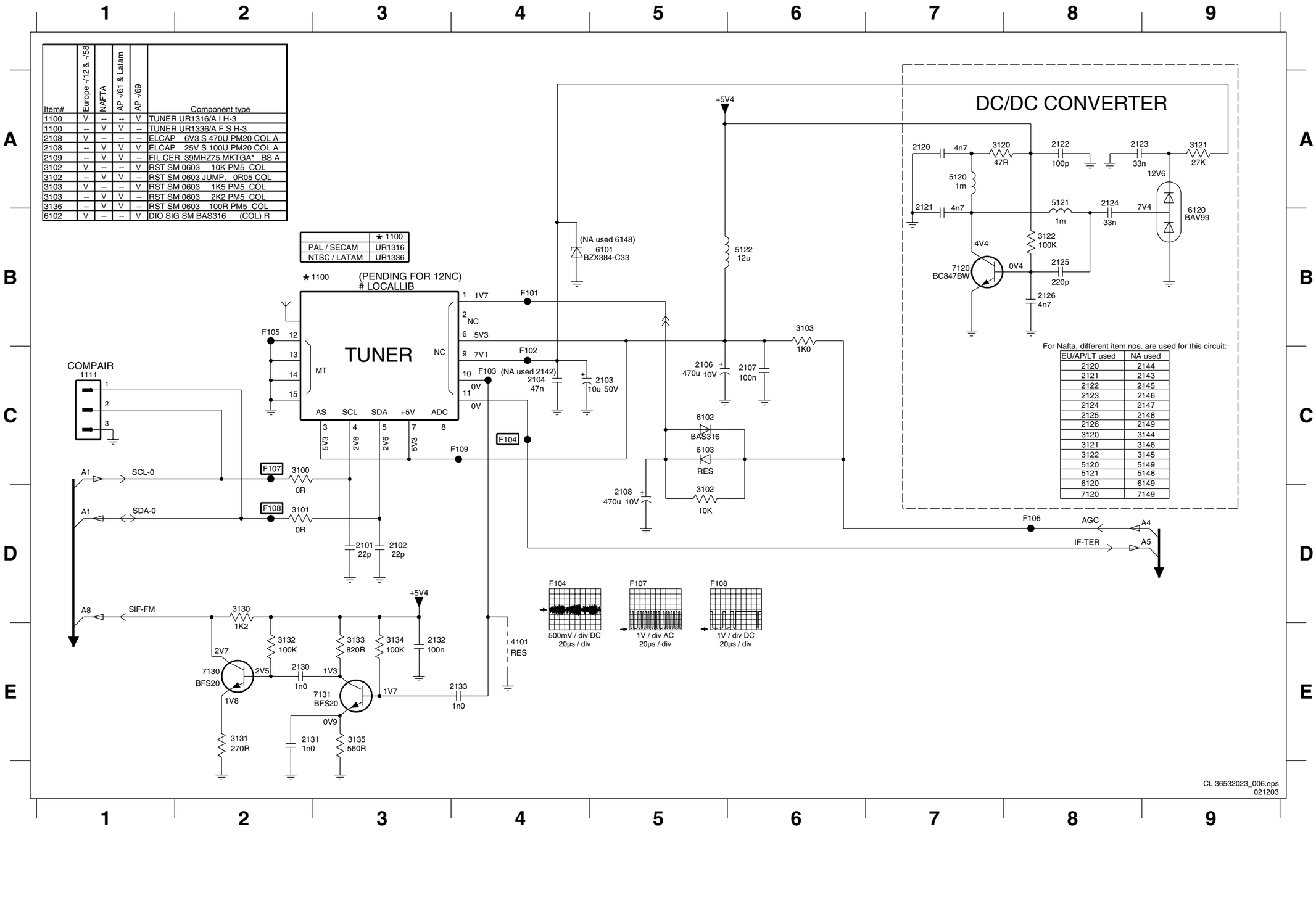
Personal Notes:

TV Board: Tuner Function

A3 TUNER FUNCTION (13"/15"/20" SCART)

Item#	Europe -/12 & -/58	NAFTA	AP -/61 & Latam	AP -/69	Component type
1100	V	--	--	V	TUNER UR1316/A I H-3
1100	--	V	V	--	TUNER UR1336/A F S H-3
2108	V	--	--	--	ELCAP 6V3 S 470U PM20 COL A
2108	--	V	V	V	ELCAP 25V S 100U PM20 COL A
2109	--	V	V	--	FIL CER 39MHZ75 MKTGA* BS A
3102	V	--	--	V	RST SM 0603 10K PM5 COL
3102	--	V	V	--	RST SM 0603 JUMP. 0R05 COL
3103	V	--	--	V	RST SM 0603 1K5 PM5 COL
3103	--	V	V	--	RST SM 0603 2K2 PM5 COL
3136	--	V	V	--	RST SM 0603 100R PM5 COL
6102	V	--	--	V	DIO SIG SM BAS316 (COL) R

	* 1100
PAL / SECAM	UR1316
NTSC / LATAM	UR1336

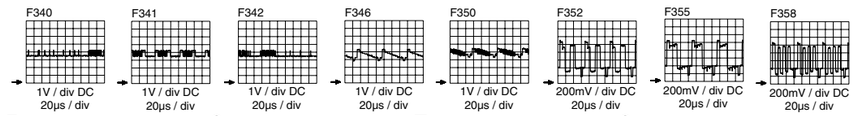


For Nafta, different item nos. are used for this circuit:

EU/AP/LT used	NA used
2120	2144
2121	2143
2122	2145
2123	2146
2124	2147
2125	2148
2126	2149
3120	3144
3121	3146
3122	3145
5120	5149
5121	5148
6120	6149
7120	7149

TV Board: IF Video Sync Chroma

A 4 IF-VIDEO -SYNC-CHROMA
(13"/15"/20" SCART & CINCH EXCEPT CINCH3L)



	★ 7301
PAL / SECAM	TDA8885
NAFTA	TDA8887
AP-NTSC / LATAM	TDA8889

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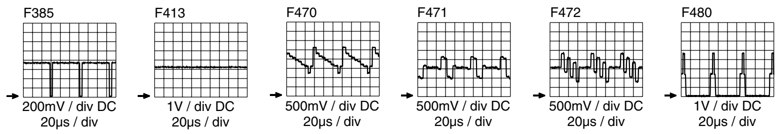
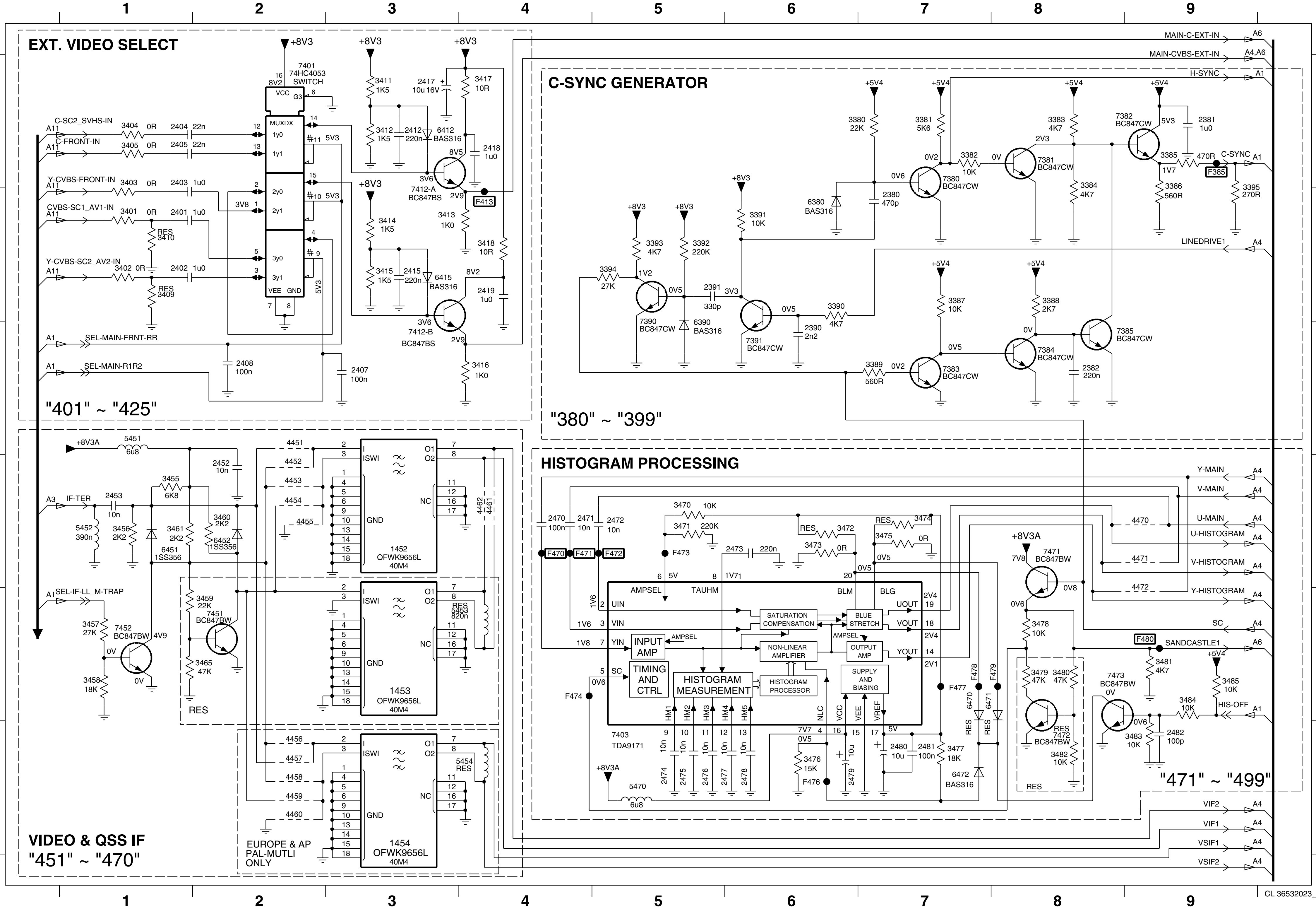
021203

TV Board: SAW Filter, Ext. Video Select, Histogram, & C-Sync Generator

A5 SAW FILTER, EXT. VIDEO SELECT, HISTROGRAM & C-SYNC GEN (13"/15"/20" EUROPE & AP-PAL)





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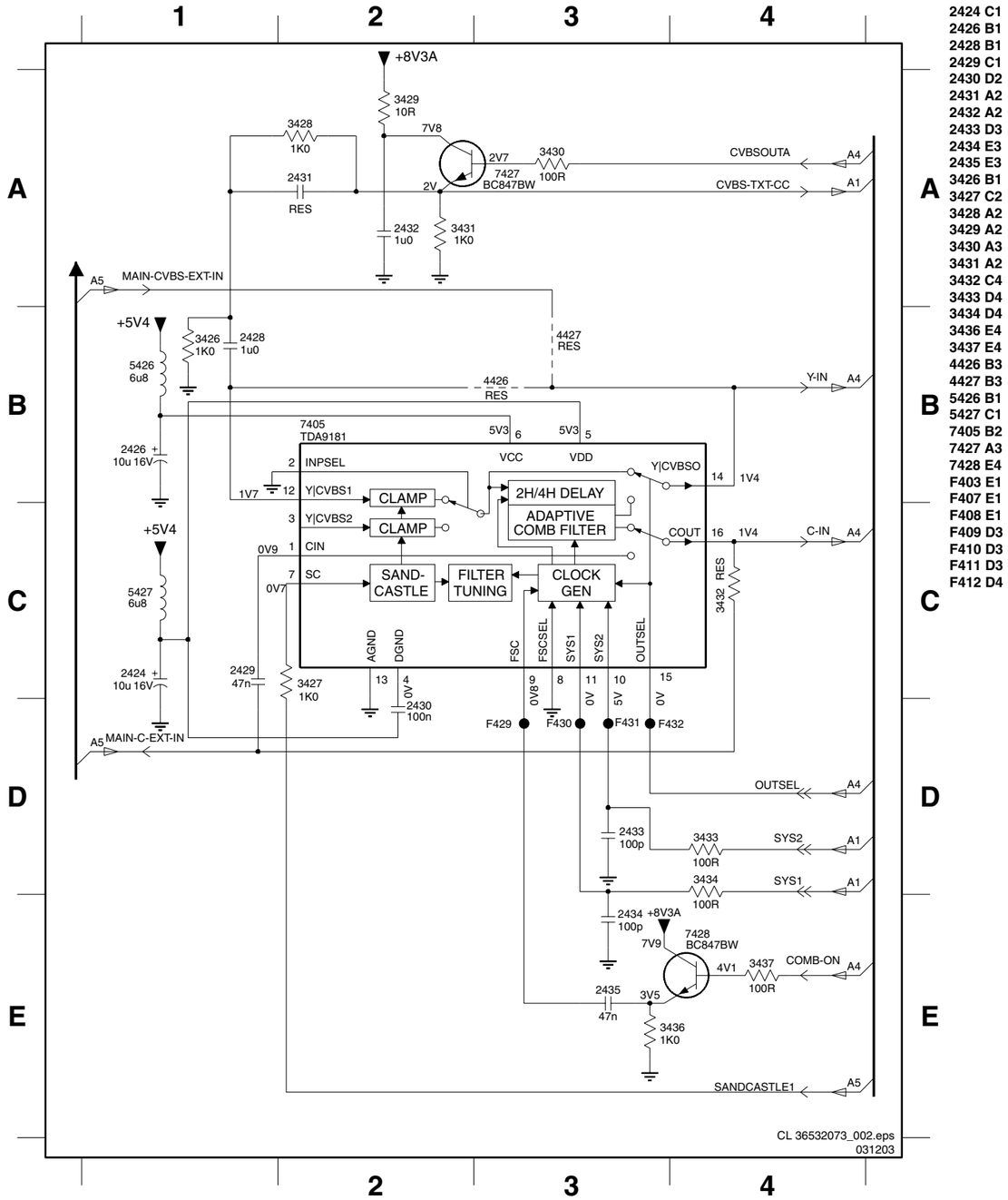
021203

1452 D3	3484 E9
1453 E3	3485 E9
1454 F3	4451 C2
2380 B7	4452 D2
2381 A9	4453 D2
2382 C8	4454 D2
2390 C6	4455 D2
2391 B5	4456 F2
2401 B1	4457 F2
2402 B1	4458 F2
2403 A1	4459 F2
2404 A1	4460 F2
2405 A1	4461 D4
2407 C3	4462 D4
2408 C2	4470 D9
2412 A3	4471 D9
2415 B3	4472 E9
2417 A3	5451 C1
2418 A4	5452 D1
2419 B4	5453 E4
2452 D2	5454 F4
2453 D1	5470 F5
2470 D4	6380 B6
2471 D4	6390 C5
2472 D5	6412 A3
2473 D6	6415 B3
2474 F5	6451 D1
2475 F5	6452 D2
2476 F5	6470 E7
2477 F6	6471 E7
2478 F6	6472 F7
2479 F6	7380 A7
2480 F7	7381 A8
2481 F7	7382 A8
2482 F9	7383 C7
3380 A6	7384 C8
3381 A7	7385 C8
3382 A7	7390 C5
3383 A8	7391 C6
3384 A8	7401 A2
3385 A9	7403 F5
3386 A9	7412-A B3
3387 B7	7412-B C3
3388 B8	7451 E2
3389 C7	7452 E1
3390 B6	7471 D8
3391 B6	7472 F8
3392 B5	7473 E8
3393 B5	F385 A9
3394 B5	F413 B4
3395 A9	F470 D4
3401 B1	F471 D4
3402 B1	F472 D5
3403 A1	F473 D5
3404 A1	F474 E4
3405 A1	F476 F6
3409 B1	F477 E7
3410 B1	F478 E7
3411 A3	F479 E8
3412 A3	F480 E9
3413 B3	
3414 B3	
3415 B3	
3416 C4	
3417 A4	
3418 B4	
3455 D1	
3456 D1	
3457 E1	
3458 E1	
3459 E2	
3460 D2	
3461 D1	
3465 E2	
3470 D5	
3471 D5	
3472 D6	
3473 D6	
3474 D7	
3475 D7	
3476 F6	
3477 F7	
3478 E8	
3479 E8	
3480 E8	
3481 E9	
3482 F8	
3483 F9	

Item#	Europe	NAFTA	AP-PAL	AP-NTSC/Latam	Component type
1452	V	--	--	--	FIL SAW SM 38MHZ9 OFWK3953L R
1452	--		--	V	FIL SAW SM 45MHZ75 OFWM1967L R
1452	--	--	V	--	FIL SAW SM 38MHZ9 OFWK7265L R
1454	V	--	--	--	FIL SAW SM 38MHZ9 OFWK9656L R
1454	--	--	V	--	FIL SAW SM 38MHZ9 OFWK9361L R
2452	V	--	V	V	CER2 0603 X7R 50V 10N COL
2453	V	--	V	V	CER2 0603 X7R 50V 10N COL
3455	V	--	V	--	RST SM 0603 6K8 PM5 COL
3456	V	--	V	--	RST SM 0603 2K2 PM5 COL
3457	V	--	V	--	RST SM 0603 27K PM5 COL
3458	V	--	V	--	RST SM 0603 18K PM5 COL
3461	V	--	V	--	RST SM 0603 2K2 PM5 COL
4451	V	--	V	V	RST SM 0603 JUMP. 0R05 COL
4453	--	--	V	--	RST SM 0603 JUMP. 0R05 COL
4455	V	--	--	V	RST SM 0603 JUMP. 0R05 COL
4457	V	--	V	--	RST SM 0603 JUMP. 0R05 COL
4458	V	--	--	--	RST SM 0603 JUMP. 0R05 COL
4460	--	--	V	--	RST SM 0603 JUMP. 0R05 COL
5451	V	--	V	--	FXDIND SM 1008 6U8 PM5 COL R
5452	V	--	V	--	FXDIND SM 0805 0U39 PM10 COL R
5452	--	V	--	V	FXDIND SM 0805 0U82 PM10 COL R
6451	V	--	V	--	DIO SIG SM 1SS356 (RHM0) R
7452	V	--	V	--	TRA SIG SM BC847BW (COL) R

TV Board: Analog Comb Filter

A6 ANALOG COMB FILTER
(13"/15"/20" SCART & CINCH EXCEPT CINCH3L)

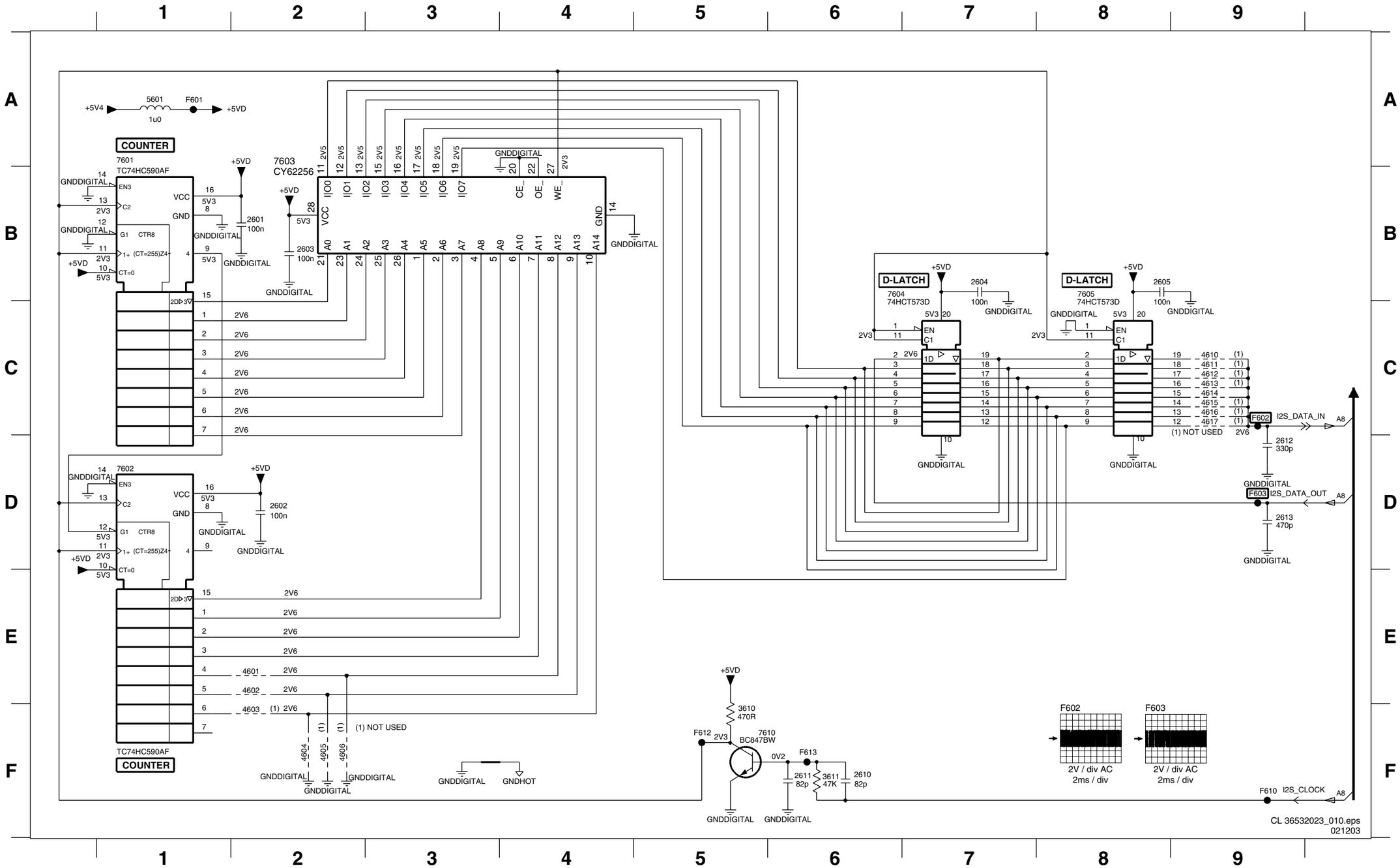


2424 C1
2426 B1
2428 B1
2429 C1
2430 D2
2431 A2
2432 A2
2433 D3
2434 E3
2435 E3
3426 B1
3427 C2
3428 A2
3429 A2
3430 A3
3431 A2
3432 C4
3433 D4
3434 D4
3436 E4
3437 E4
4426 B3
4427 B3
5426 B1
5427 C1
7405 B2
7427 A3
7428 E4
F403 E1
F407 E1
F408 E1
F409 D3
F410 D3
F411 D3
F412 D4

Personal Notes:

TV Board: Audio Delay Line

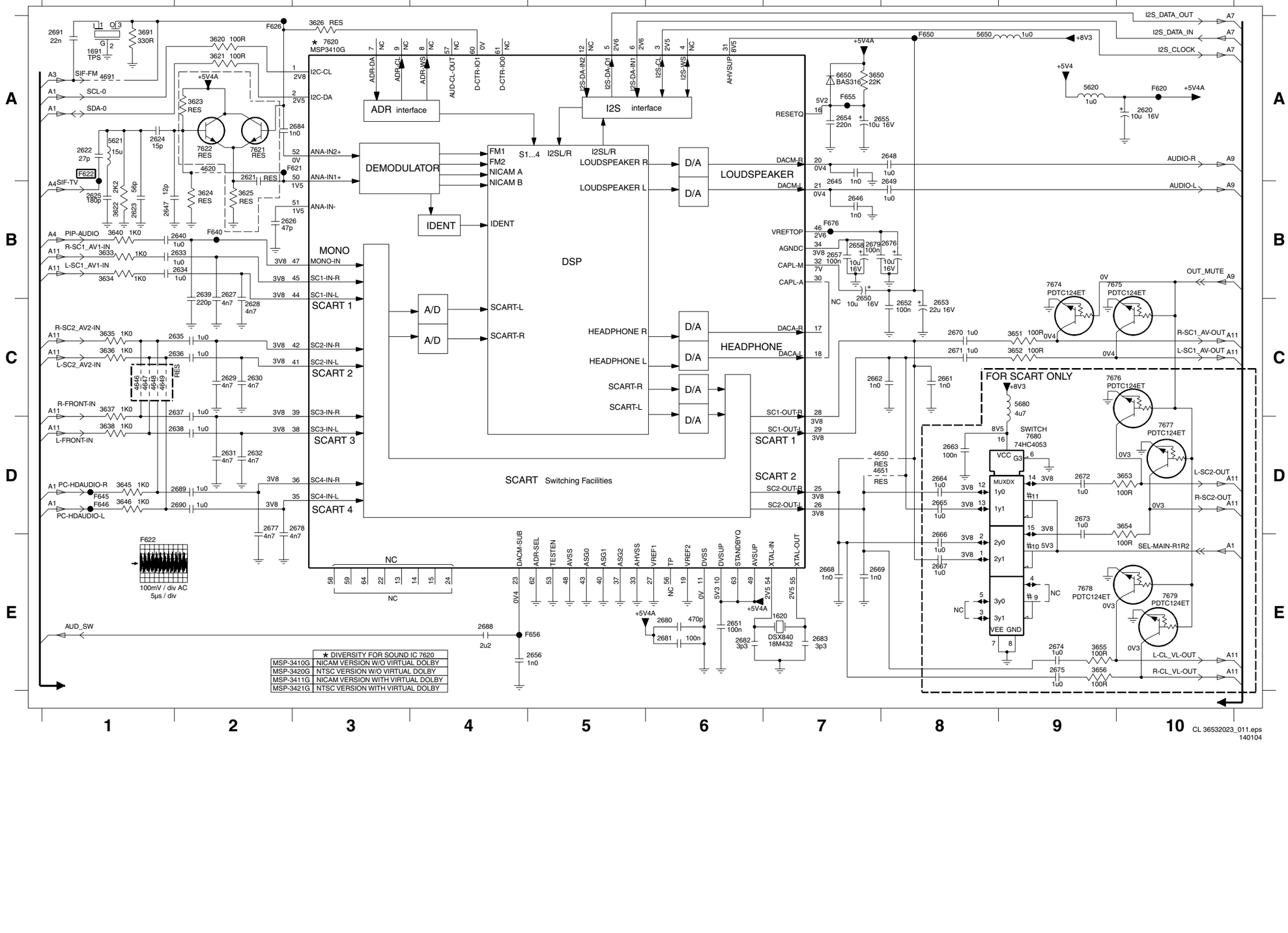
A 7 AUDIO DELAY LINE (COMMON)



2601 B2
2602 D2
2603 B2
2604 B7
2605 B8
2610 F6
2611 F6
2612 D9
2613 D9
3610 F5
3611 F6
4601 E2
4602 E2
4603 F2
4604 F2
4605 F2
4606 F2
4610 C9
4611 C9
4612 C9
4613 C9
4614 C9
4615 C9
4616 C9
4617 C9
5601 A1
7601 A1
7602 D1
7603 A2
7604 B7
7605 B8
7610 F6
F601 A1
F602 C9
F603 D9
F610 F9
F612 F5
F613 F6

TV Board: Audio Processing

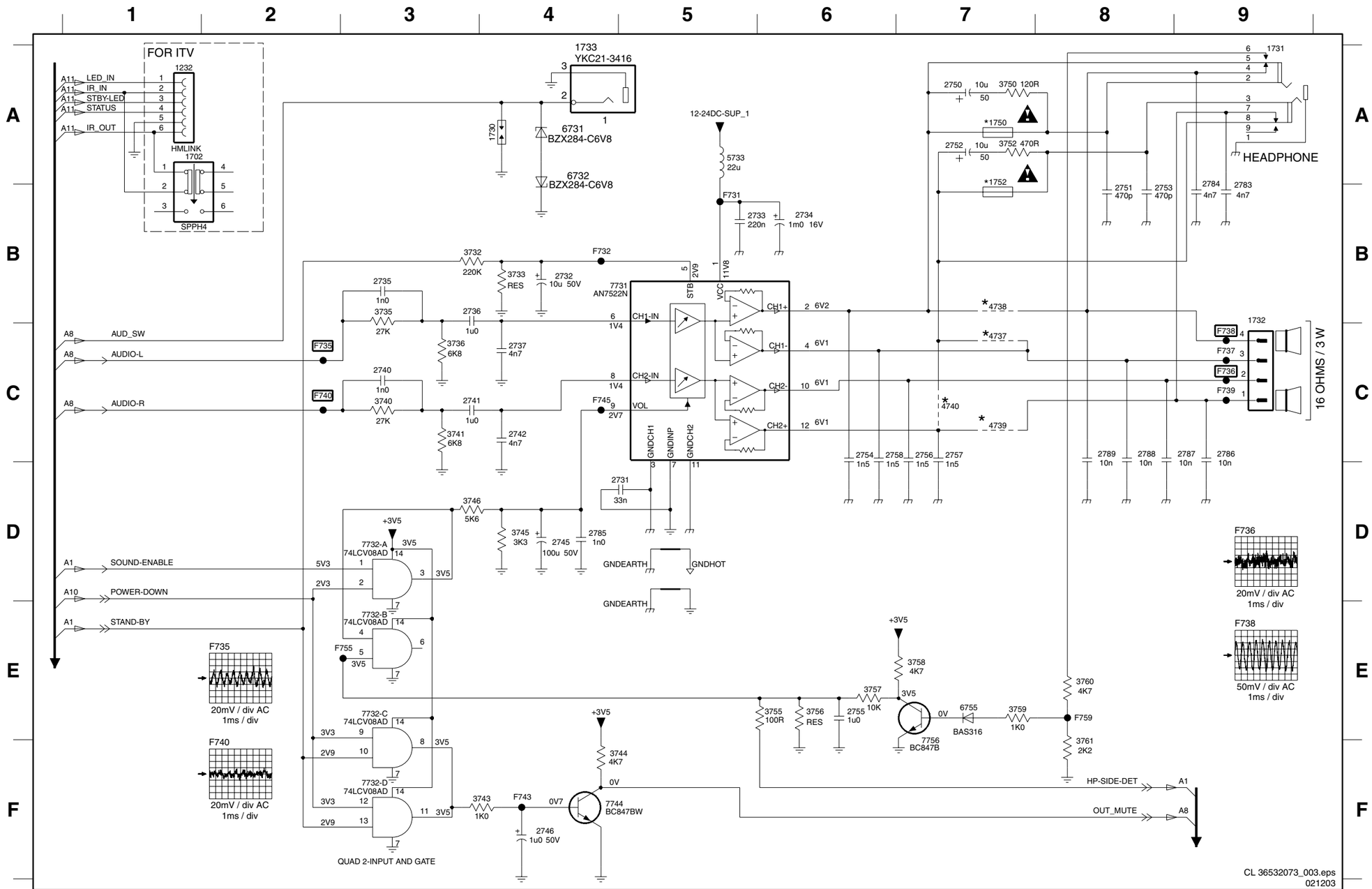
A8 AUDIO PROCESSING (COMMON)



Item#	Europe Non-VD 13°/15°/20°	NAFTA/AP-NTSC/Latam 15°/20°	AP-PAL Non-VD 15°/20°	Component type
2663	--	--	--	CER2 0603 X7R 16V 100N COL
2664	--	--	--	CER2 0603 Y5V 10V 1U COL
2665	--	--	--	CER2 0603 Y5V 10V 1U COL
2666	--	--	--	CER2 0603 Y5V 10V 1U COL
2667	--	--	--	CER2 0603 Y5V 10V 1U COL
2672	--	--	--	CER2 0603 Y5V 10V 1U COL
2673	--	--	--	CER2 0603 Y5V 10V 1U COL
2674	V	--	--	CER2 0603 Y5V 10V 1U COL
2675	V	--	--	CER2 0603 Y5V 10V 1U COL
3653	--	--	--	RST SM 0603 100R PM5 COL
3654	--	--	--	RST SM 0603 100R PM5 COL
3655	V	--	--	RST SM 0603 100R PM5 COL
3656	V	--	--	RST SM 0603 100R PM5 COL
5680	--	--	--	FXDIND SM 1008 4U7 PM5 COL R
7620	--	V	--	IC SM MSP3420G-QI-B8-V3(MIAS)Y
7620	V	--	V	IC SM MSP3410G-QI-C12 (MIAS) Y
7676	--	--	--	TRA SIG SM PDTC124ET (COL) R
7677	--	--	--	TRA SIG SM PDTC124ET (COL) R
7678	V	--	--	TRA SIG SM PDTC124ET (COL) R
7679	V	--	--	TRA SIG SM PDTC124ET (COL) R
7680	--	--	--	IC SM 74HC4053PW (PHSE) R

TV Board: Audio Amplifier

A9 AUDIO AMPLIFIER



1232 A1
1702 A1
1730 A4
1731 A9
1732 B9
1733 A4
1750 A7
1752 B7
2731 D5
2732 B4
2733 B5
2734 B6
2735 B3
2736 B3
2737 C4
2740 C3
2741 C3
2742 C4
2745 D4
2746 F4
2750 A7
2751 B8
2752 A7
2753 B8
2754 C6
2755 E6
2756 C7
2757 C7
2758 C6
2783 A9
2784 A9
2785 D4
2786 C9
2787 C9
2788 C8
2789 C8
3732 B3
3733 B4
3735 B3
3736 C3
3740 C3
3741 C3
3743 F4
3744 F5
3745 D4
3746 D3
3750 A7
3752 A7
3755 E6
3756 E6
3757 E6
3758 E7
3759 E7
3760 E8
3761 E8
4737 C7
4738 B7
4739 C7
4740 C7
5733 A5
6731 A4
6732 A4
6755 E7
7731 B5
7732-A D3
7732-B E3
7732-C E3
7732-D F3
7744 F4
7756 F7
F731 B5
F732 B4
F735 C2
F736 C9
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F740 C2
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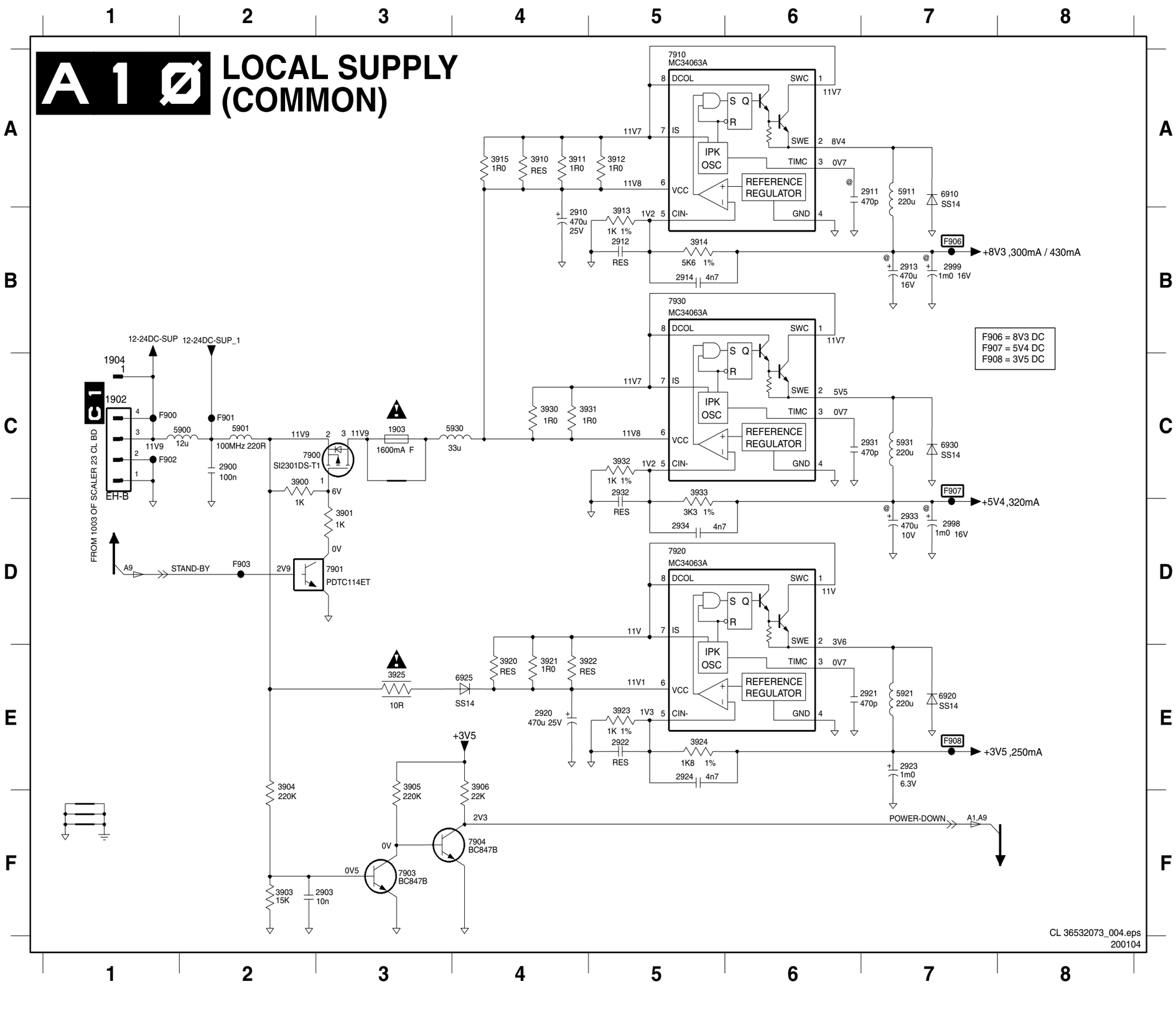
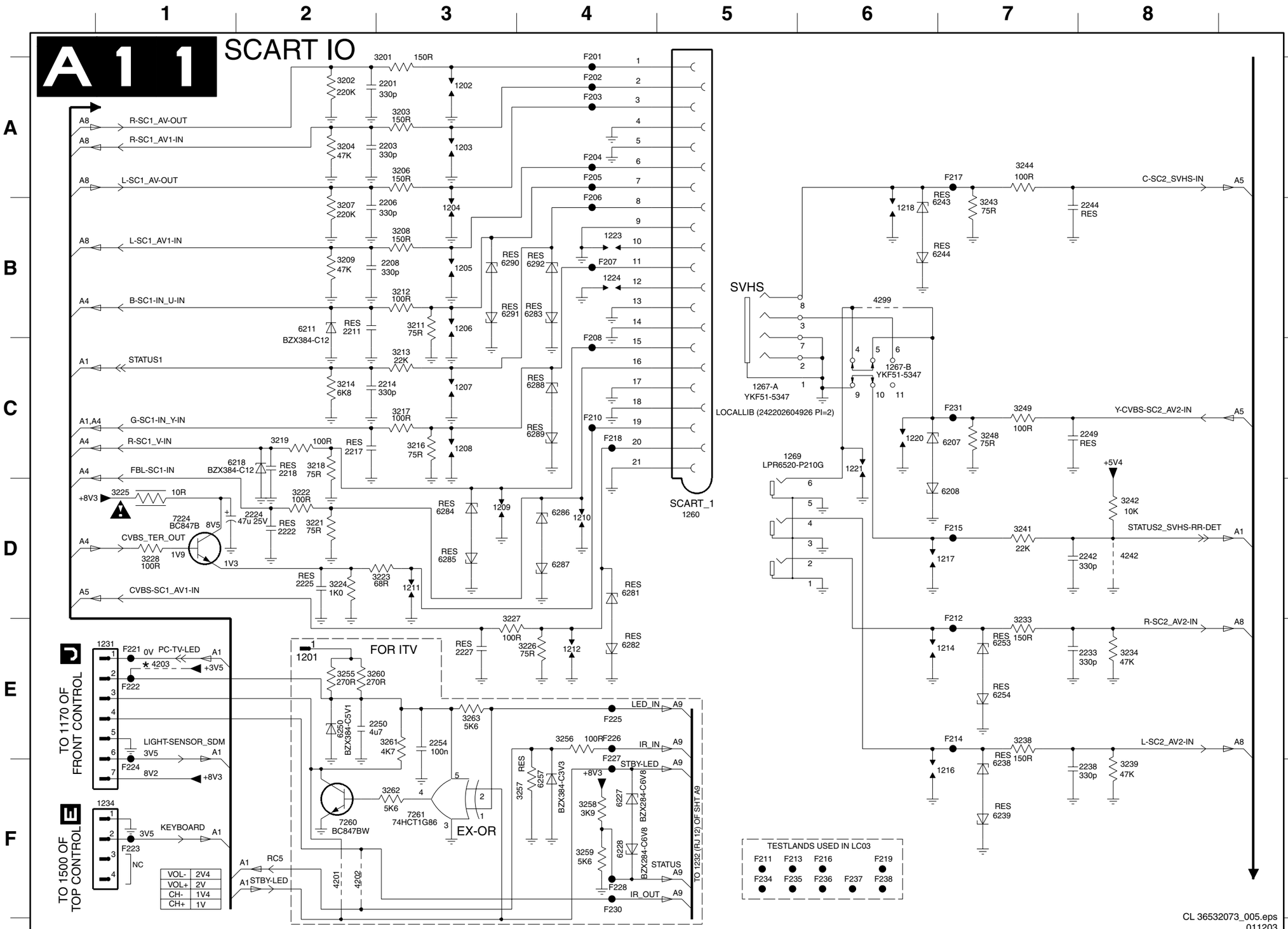
F755 E3
F759 E8

TV Board: Local Supply



1902 C1
1903 C3
1904 C1
2900 C2
2903 F3
2910 B4
2911 A7
2912 B5
2913 B7
2914 B5
2920 E4
2921 E7
2922 E5
2923 E7
2924 E5
2931 C7
2932 C5
2933 D7
2934 D5
2998 D7
2999 B7
3900 C2
3901 D3
3903 F2
3904 E2
3905 E3
3906 E4
3910 A4
3911 A4
3912 A5
3913 B5
3914 B5
3915 A4
3920 E4
3921 E4
3922 E4
3923 E5
3924 E5
3925 E3
3930 C4
3931 C4
3932 C5
3933 C5
5900 C2
5901 C2
5911 A7
5921 E7
5930 C4
5931 C7
6910 A7
6920 E7
6925 E4
6930 C7
7900 C2
7901 D3
7903 F3
7904 F4
7910 A5
7920 D5
7930 B5
F900 C1
F901 C2
F902 C1
F903 D2
F906 B7
F907 C7
F908 E7

TV Board: SCART I/O



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1202 A3	3258 F4
1203 A3	3259 F4
1204 B3	3260 E2
1205 B3	3261 E3
1206 B3	3262 F3
1207 C3	3263 E3
1208 C3	4201 F2
1209 D3	4202 F2
1210 D4	4203 E1
1211 D3	4242 D8
1212 E4	4299 B6
1214 E7	6207 C7
1216 F7	6208 D7
1217 D7	6211 B2
1218 B6	6218 C2
1220 C6	6227 F4
1221 C6	6228 F4
1223 B4	6238 F7
1224 B4	6239 F7
1231 E1	6243 B7
1234 F1	6244 B7
1260 D5	6250 E2
1267-A C5	6253 E7
1267-B C6	6254 E7
1268-1 F5	6257 F4
1268-2 E5	6281 D4
1269 C5	6282 E4
2201 A3	6283 B4
2203 A3	6284 D3
2206 B3	6285 D3
2208 B3	6286 D4
2211 B2	6287 D4
2214 C3	6288 C4
2217 C2	6289 C4
2218 C2	6290 B3
2222 D2	6291 B3
2224 D2	6292 B4
2225 D2	7224 D1
2227 E3	7260 F2
2233 E8	7261 F3
2238 F8	F201 A4
2242 D8	F202 A4
2244 B8	F203 A4
2249 C8	F204 A4
2250 E3	F205 A4
2254 E3	F206 B4
3201 A3	F207 B4
3202 A2	F208 C4
3203 A3	F210 C4
3204 A2	F212 E7
3206 A3	F214 E7
3207 B2	F215 D7
3208 B3	F217 A7
3209 B2	F218 C4
3211 B3	F221 E1
3212 B3	F222 E1
3213 C3	F223 F1
3214 C2	F224 F1
3216 C3	F225 E4
3217 C3	F226 E4
3218 C2	F227 F4
3219 C2	F228 F4
3221 D2	F230 F4
3222 D2	F231 C7
3223 D3	
3224 D2	
3225 D1	
3226 E4	
3227 E3	
3228 D1	
3233 E7	
3234 E8	
3238 E7	
3239 F8	
3241 D7	
3242 D8	
3243 B7	
3244 A7	
3248 C7	
3249 C7	
3255 E2	
3256 E4	

Layout TV Board (13”/15”) (Overview Top Side)

1010	A3	1691	B4	2019	C4	2104	B2	2303	B3	2360	B3	2449	B2	2625	A4	2645	B5	2664	C4
1057	B4	1702	C4	2020	C4	2106	B1	2304	B2	2361	B3	2473	A4	2627	B4	2646	B5	2665	C4
1100	A1	1730	C4	2021	C3	2108	B1	2308	A2	2412	C2	2474	A4	2628	A4	2647	B4	2666	C4
1111	B1	1731	C3	2041	B4	2120	B2	2310	B2	2415	C2	2475	A4	2629	B5	2648	B5	2667	C4
1201	C2	1732	C5	2042	B4	2121	B2	2312	A3	2417	B2	2476	A4	2630	A5	2649	B5	2668	B5
1206	B1	1733	C4	2043	B4	2122	B2	2315	B3	2418	B2	2477	A4	2631	A5	2650	B5	2669	B5
1208	C1	1750	C5	2044	B4	2123	B2	2317	A2	2419	C2	2478	A4	2632	B5	2652	B5	2670	B5
1231	C2	1752	C5	2045	B4	2124	B2	2319	A2	2424	B3	2479	A3	2633	B4	2653	B5	2671	B5
1232	C4	1902	A6	2046	B3	2125	B2	2321	A3	2426	B2	2480	A3	2634	A4	2654	B5	2672	C4
1234	C3	1903	A5	2049	B4	2126	B2	2325	A3	2429	B3	2481	A3	2635	B5	2655	B5	2673	C4
1260	C1	1904	A5	2052	C4	2211	B1	2326	B2	2430	B2	2620	B4	2636	A4	2656	B5	2674	B5
1267	C3	2010	B3	2053	B4	2217	C1	2330	B3	2433	B2	2621	B4	2637	A5	2657	B5	2675	B5
1269	C2	2016	C3	2055	C4	2218	C1	2331	B3	2434	B2	2622	A4	2638	B5	2658	B5	2676	A4
1330	A3	2017	C3	2057	B4	2224	C1	2332	B3	2435	C2	2623	A4	2639	B4	2661	B5	2677	B5
1620	B4	2018	C4	2103	B2	2250	C3	2351	B3	2448	B2	2624	A4	2640	B4	2662	B5	2678	B5

2679	B4	2742	B5	2923	A4	3019	B3	3053	A3	3102	B1	3307	B3	3346	B3	3433	B2	3637	A4
2680	B4	2745	C5	2932	A5	3021	B3	3055	A3	3120	B2	3312	B3	3347	B3	3434	B2	3638	B5
2681	B4	2746	C4	2933	A5	3022	B3	3056	A3	3121	B2	3313	B3	3348	B2	3436	C2	3640	B4
2682	B4	2750	C5	2934	A5	3023	B4	3057	C4	3122	B2	3314	B3	3360	B3	3437	B2	3645	A4
2683	B4	2752	C5	2998	A5	3029	B3	3059	C4	3211	B1	3318	A2	3361	B3	3620	B4	3646	A4
2684	B4	2753	C5	2999	A6	3033	C3	3060	C4	3212	B1	3319	A2	3362	B3	3621	B4	3650	B4
2689	B5	2756	C5	3002	C3	3034	B3	3062	B3	3216	C1	3325	A4	3411	C2	3622	A4	3651	B5
2690	A5	2757	C5	3006	B3	3042	C3	3063	B3	3217	C1	3326	B2	3412	C2	3623	B4	3652	B5
2691	B4	2900	A5	3007	C3	3043	C3	3064	B3	3218	C1	3329	A2	3413	B2	3624	B4	3653	C4
2732	B5	2903	A5	3008	B3	3044	C4	3065	B3	3219	C1	3333	B3	3414	B2	3625	A4	3654	C4
2733	B5	2910	A5	3010	B3	3045	B3	3070	B4	3225	C1	3334	B3	3415	C2	3626	B4	3655	B5
2734	A5	2912	A6	3014	B3	3046	B3	3071	B4	3228	C1	3335	B3	3416	C2	3633	B4	3656	B5
2735	B5	2913	A6	3015	B3	3049	B3	3084	B4	3255	C2	3336	A3	3417	B2	3634	A4	3691	B4
2740	B5	2914	A6	3016	C3	3051	C3	3086	B3	3260	C2	3337	A3	3418	C2	3635	B5	3732	B5
2741	B5	2920	A4	3018	B4	3052	A3	3099	C3	3301	A4	3338	B3	3432	C3	3636	A4	3733	B5

3735	B5	3914	A6	4325	B2	5121	B2	5901	A5	6290	B1	7022	B3	7428	B2	7910	A6
3736	B5	3915	A6	4449	B2	5122	B2	5911	A6	6291	B1	7053	C4	7620	B4	7920	A4
3740	B5	3920	A4	4463	C2	5301	A4	5921	A4	6360	B3	7062	B3	7621	B4	7930	A5
3741	B5	3921	A4	4464	B2	5302	A3	5930	A5	6361	B3	7064	B3	7622	A4		
3752	C5	3922	A4	4465	C2	5303	A2	5931	A5	6362	B3	7066	B4	7674	B5		
3900	A5	3925	A5	4466	B2	5326	B2	6101	B2	6412	C2	7120	B2	7675	B5		
3901	A5	3930	A5	4620	B4	5426	B2	6102	B1	6415	C2	7261	C4	7676	C4		
3903	A5	3931	A5	4646	A4	5427	B2	6103	B1	6650	B5	7301	A3	7678	B5		
3904	A5	3932	A5	4647	A4	5451	B1	6120	B2	6731	C4	7303	B3	7679	B5		
3905	A5	3933	A5	4648	A4	5470	A4	6211	B1	6732	C4	7330	B3	7680	C4		
3906	A4	4008	B3	4649	A4	5620	B4	6218	C1	6910	A6	7360	B3	7731	B5		
3910	A6	4057	B4	4691	B4	5621	A4	6284	C1	6920	A4	7401	C2	7900	A5		
3911	A6	4302	A4	4738	C5	5650	B5	6285	C1	6925	A4	7403	A3	7901	A5		
3912	A5	4303	A4	5042	B4	5733	A5	6288	C1	6930	A5	7405	B2	7903	A5		
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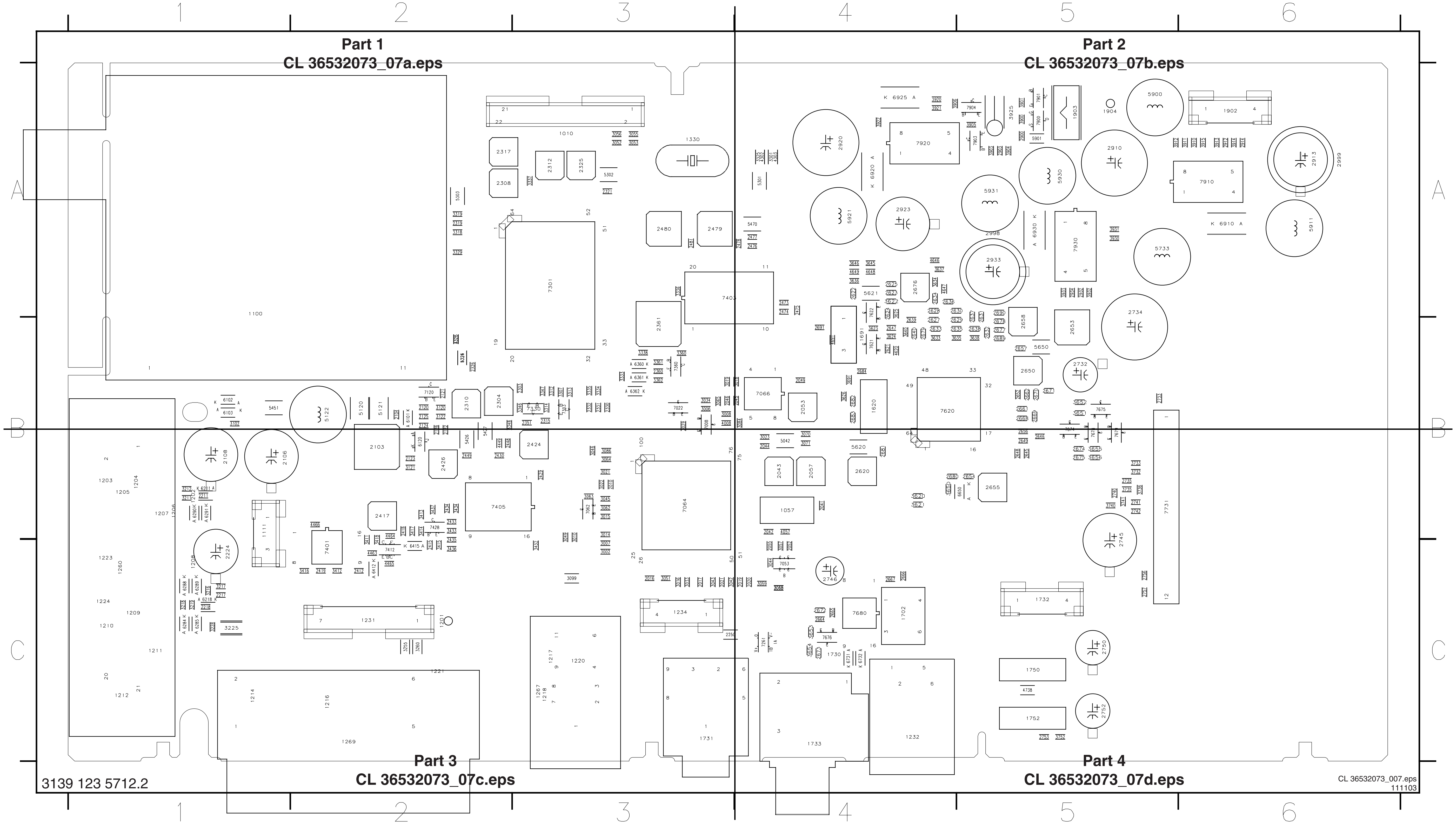

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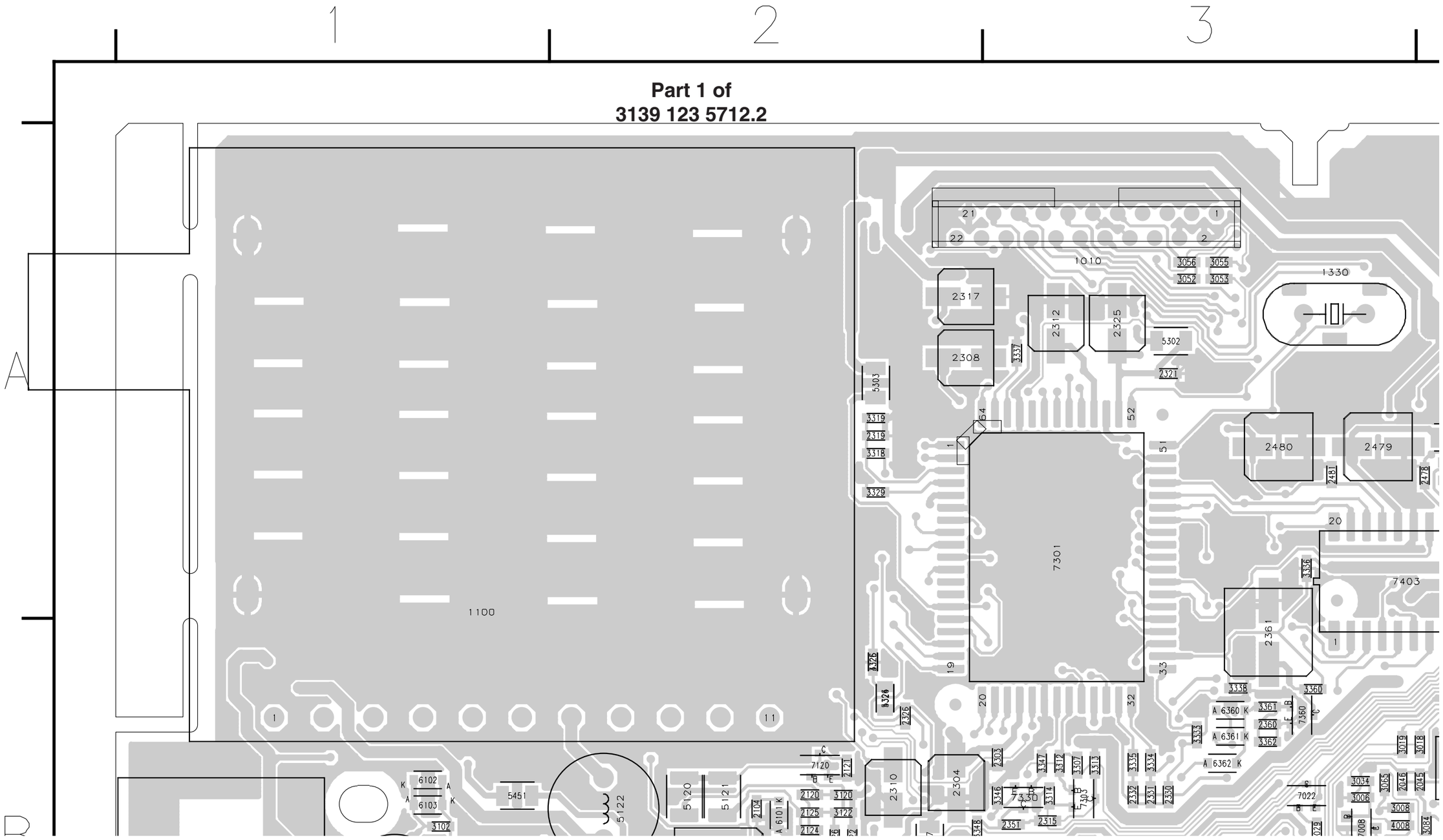
111103

Layout TV Board (13”/15”) (Part 1 Top Side)

Part 1 of
3139 123 5712.2



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141003

Layout TV Board (13”/15”) (Part 2 Top Side)

4 5 6

A

Part 2 of
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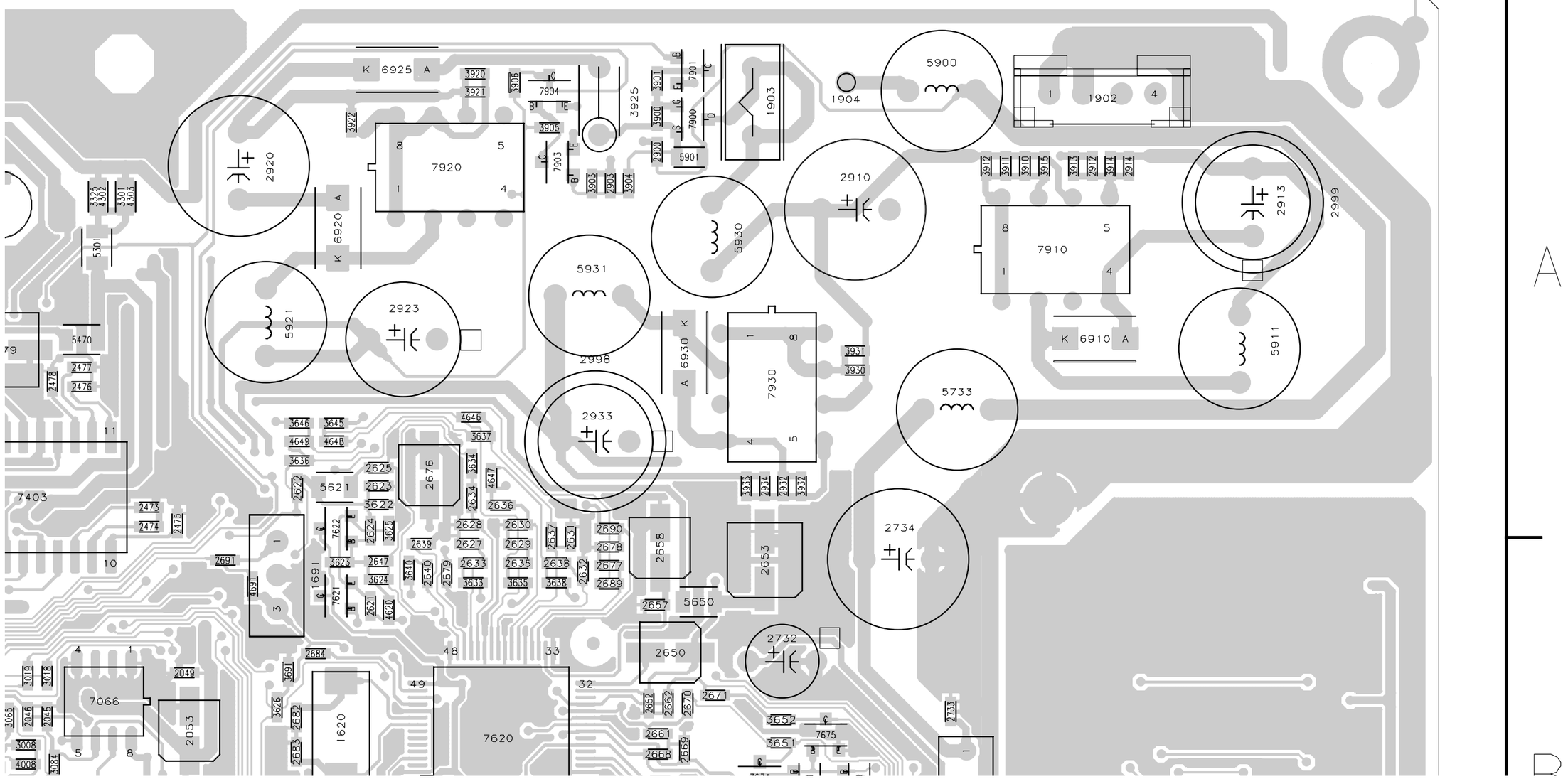

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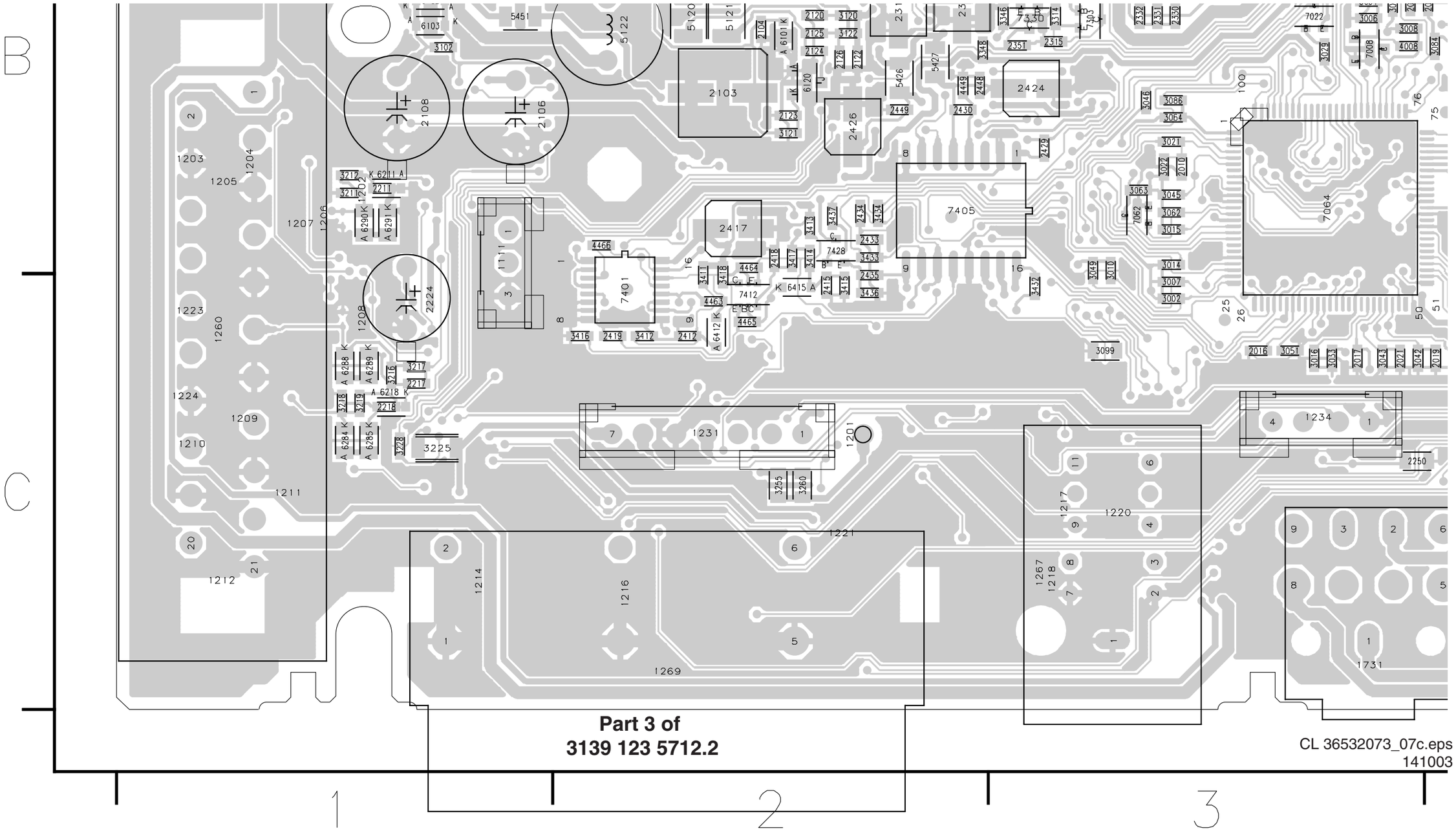

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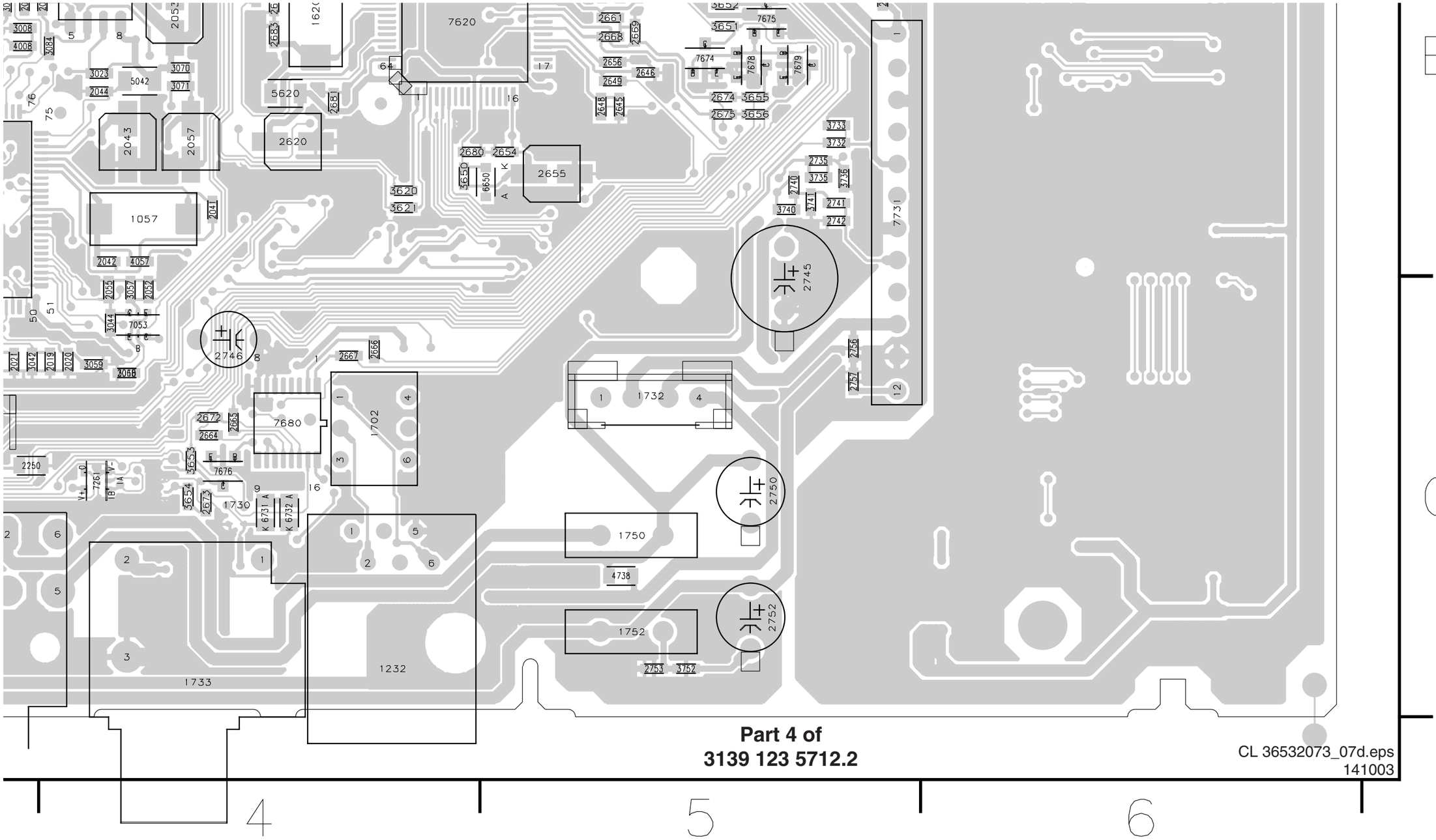

Part 4 of
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Layout TV Board (13”/15”) (Overview Bottom Side)

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1203	B6	1224	C6	2061	C4	2227	C6	2314	B5	2343	A4	2403	B6	2602	C1	2751	C2	2931	A2
1204	B6	1452	A5	2101	B6	2233	C6	2316	B5	2344	A4	2404	C5	2603	B1	2754	B2	3003	C4
1205	B6	1453	A5	2102	B6	2238	C5	2318	A5	2345	A4	2405	B5	2604	B1	2755	C3	3004	C4
1207	B6	1454	B5	2107	B5	2242	C5	2320	A5	2346	A4	2407	C5	2605	B1	2758	B2	3009	B4
1209	C6	2012	B3	2130	B5	2244	C5	2322	A4	2347	B4	2408	C5	2610	C1	2783	C4	3012	B4
1210	C6	2013	B5	2131	B5	2249	C5	2324	A5	2348	B5	2428	C5	2611	C1	2784	C3	3013	B4
1211	C6	2014	B5	2132	B5	2254	C4	2327	B5	2349	B4	2431	B5	2612	B1	2785	B2	3017	B3
1212	C6	2015	B5	2133	B5	2301	B4	2335	B4	2350	B4	2432	B5	2613	B1	2786	C2	3024	B4
1214	C6	2047	B3	2201	B6	2302	A4	2336	A4	2380	A6	2452	A6	2626	B3	2787	C2	3028	B4
1216	C5	2048	B3	2203	B6	2305	A5	2337	B4	2381	A6	2453	A6	2651	B3	2788	C2	3030	B3
1217	C4	2050	B3	2206	B6	2306	A5	2338	B4	2382	A6	2470	B4	2663	C3	2789	C2	3031	B5
1218	C4	2051	B3	2208	C6	2307	A5	2339	B5	2390	A6	2471	A4	2688	B2	2911	A1	3032	B5
1220	C4	2054	B5	2214	B6	2309	B4	2340	A4	2391	A6	2472	A4	2731	B2	2921	A3	3035	B5
1221	C5	2056	C3	2222	C6	2311	A4	2341	A4	2401	C5	2482	A4	2736	B2	2922	A3	3036	A4

3037	A4	3085	B4	3149	B5	3226	C6	3259	C4	3317	A5	3343	A4	3384	A6	3404	C5	3460	A6
3038	A4	3088	B3	3201	B6	3227	C6	3261	C4	3320	A4	3344	A4	3385	A6	3405	C5	3461	A6
3047	B3	3092	B5	3202	B6	3233	C6	3262	C4	3321	A5	3345	A4	3386	A6	3409	C6	3465	A5
3048	B4	3093	B5	3203	B6	3234	C6	3263	C4	3322	A4	3349	A4	3387	A6	3410	C5	3470	A4
3050	B3	3094	B4	3204	B6	3238	C5	3302	B5	3323	A4	3350	B4	3388	A6	3426	B5	3471	A4
3054	C3	3100	B6	3206	B6	3239	C5	3303	B4	3324	A5	3351	B4	3389	A6	3427	B5	3472	A4
3058	C3	3101	B6	3207	B6	3241	C4	3304	A4	3327	B5	3352	B4	3390	A6	3428	B5	3473	A4
3061	C3	3103	B5	3208	B6	3242	C5	3305	A4	3328	B5	3354	B4	3391	A6	3429	B5	3474	A4
3066	B3	3130	B5	3209	C6	3243	C5	3306	A5	3330	B4	3355	B4	3392	A6	3430	B5	3475	A4
3068	B3	3131	B5	3213	C6	3244	C5	3308	A5	3331	A5	3357	B4	3393	A6	3431	B5	3476	A4
3069	B3	3132	B5	3214	B6	3248	C5	3309	B5	3332	B5	3358	A4	3394	A6	3455	A6	3477	A4
3072	B3	3133	B5	3221	C6	3249	C5	3310	A5	3339	A4	3380	A6	3395	A6	3456	A6	3478	B4
3081	B3	3134	B5	3222	C6	3256	C3	3311	A5	3340	A4	3381	A6	3401	C6	3457	A6	3479	B4
3082	B3	3135	B5	3223	C6	3257	C4	3315	B5	3341	B4	3382	A6	3402	C6	3458	A6	3480	B3
3083	B3	3148	B5	3224	C6	3258	C4	3316	B5	3342	B4	3383	A6	3403	B5	3459	A5	3481	B4

3482	B3	3759	C3	4426	C5	4471	A4	4617	B1	6031	B3	6283	C6	7067	B3	7383	A6	7605	B1
3483	A4	3760	C3	4427	C5	4472	B4	4650	B2	6207	C5	6286	C6	7068	B3	7384	A6	7610	C1
3484	A4	3761	C3	4451	A5	4601	C1	4651	B2	6208	C5	6287	C6	7069	B3	7385	A6	7677	C3
3485	A4	3923	A3	4452	A5	4602	C1	4737	C2	6227	C3	6292	C6	7070	B4	7390	A6	7732	B3
3610	C1	3924	A3	4453	A5	4603	C1	4739	C2	6228	C3	6327	B5	7130	B5	7391	A6	7744	C3
3611	C1	4036	A4	4454	A5	4604	C1	4740	C2	6238	C5	6380	A6	7131	B5	7427	B5	7756	C3
3743	C3	4101	B5	4455	A5	4605	C1	5040	C3	6239	C5	6390	A6	7224	C6	7451	A5		
3744	C3	4201	C4	4456	A6	4606	C1	5041	B3	6243	C4	6451	A6	7260	C4	7452	A6		
3745	B2	4202	C3	4457	A5	4610	B1	5050	B4	6244	C4	6452	B6	7302	B5	7471	B4		
3746	C2	4203	C4	4458	A6	4611	B1	5452	B6	6250	C5	6470	A4	7350	B4	7472	B4		
3750	C2	4242	C4	4459	B6	4612	B1	5453	A5	6253	C6	6471	A4	7353	B4	7473	A4		
3755	B2	4299	C5	4460	A6	4613	B1	5454	A5	6254	C6	6472	A4	7356	B4	7601	C1		
3756	C3	4301	A5	4461	A5	4614	B1	5601	B1	6257	C4	6755	C3	7380	A6	7602	C2		
3757	C3	4320	A4	4462	A5	4615	B1	5680	C3	6281	C6	7036	A4	7381	A6	7603	B1		
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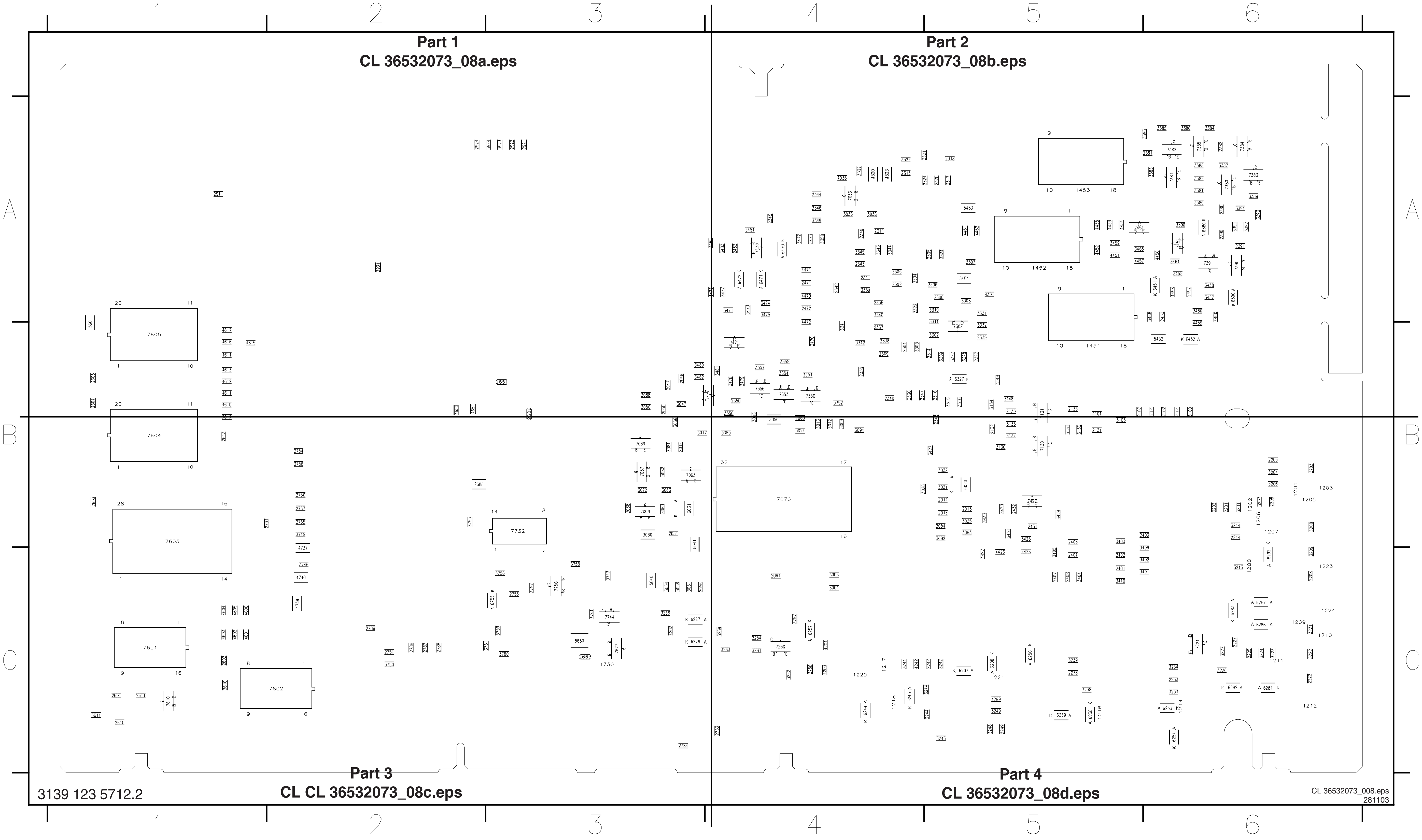
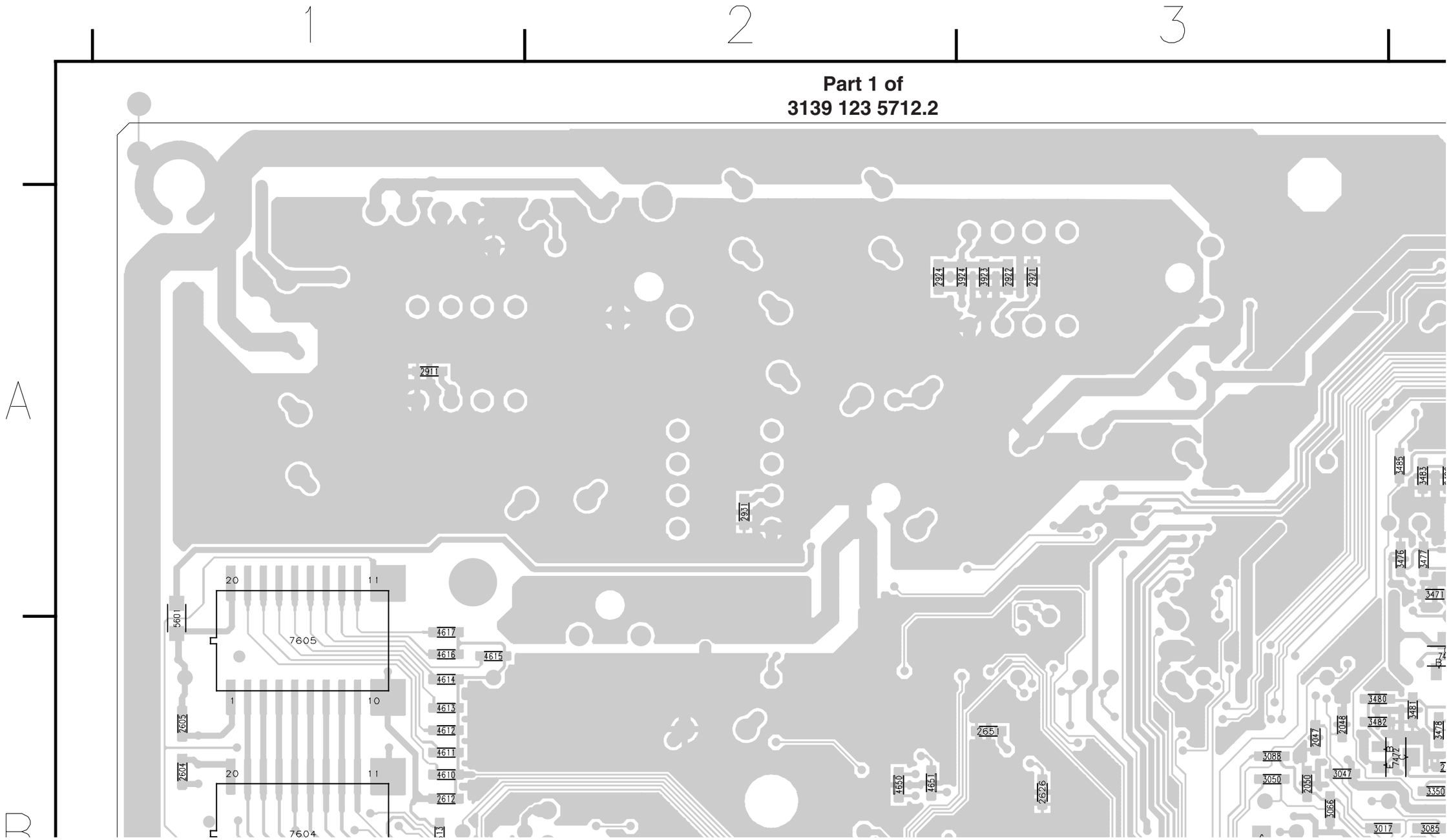


Layout TV Board (13”/15”) (Part 1 Bottom Side)



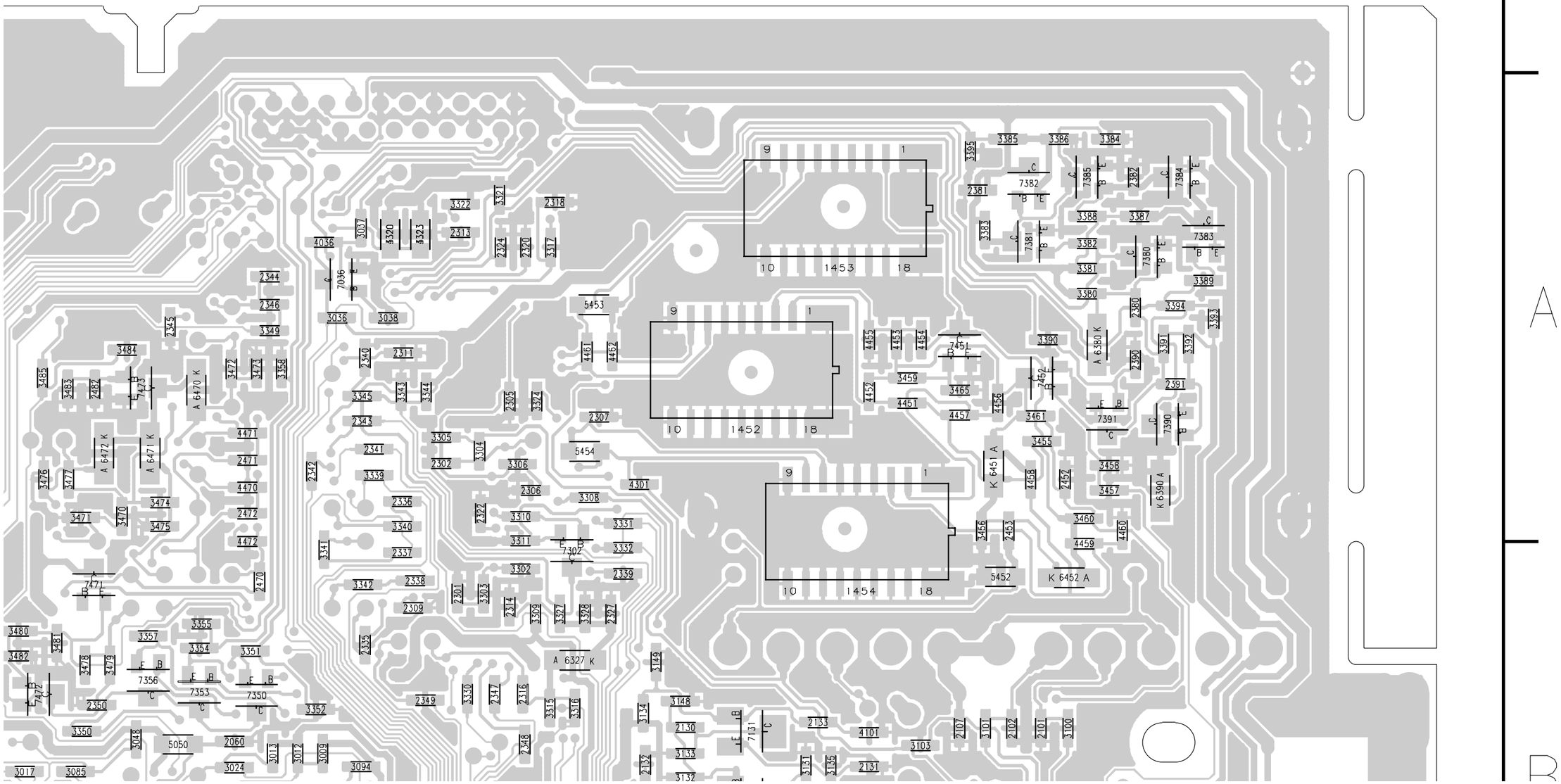
CL 36532073_08a.eps
141003

Layout TV Board (13”/15”) (Part 2 Bottom Side)

4 5 6

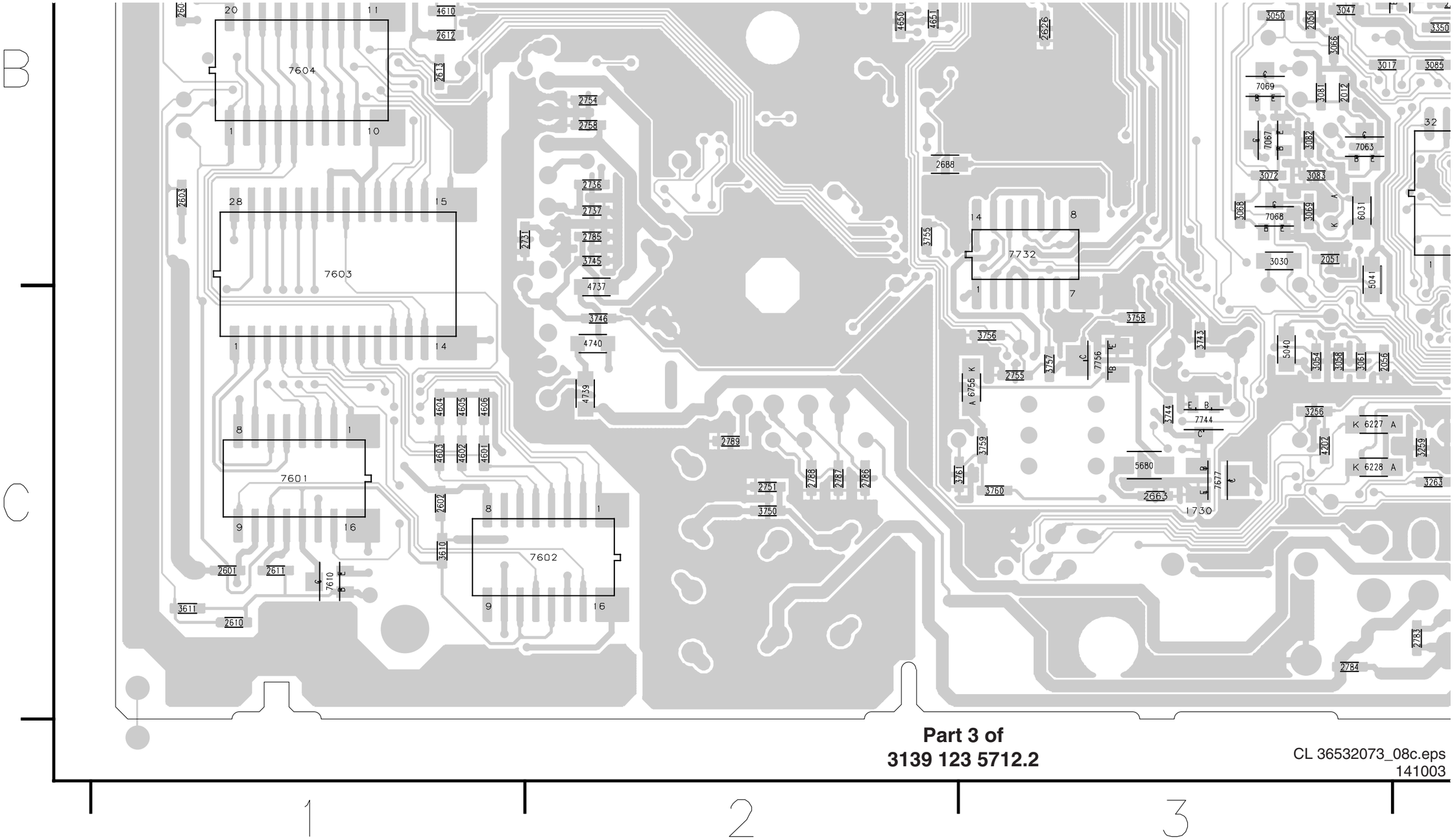
A

Part 2 of
3139 123 5712.2



CL 36532073_08b.eps
141003

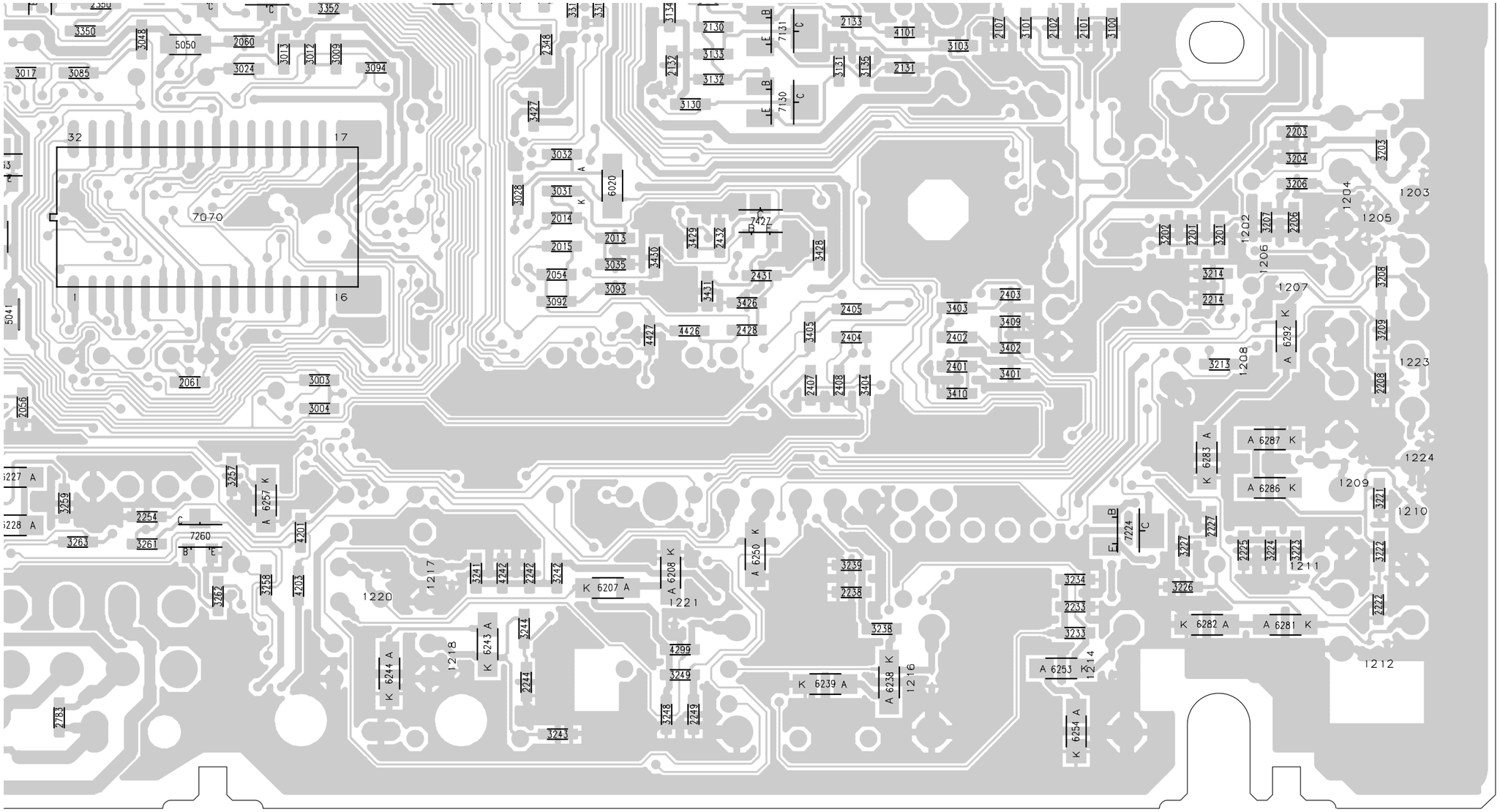
Layout TV Board (13”/15”) (Part 3 Bottom Side)



Part 3 of
3139 123 5712.2

CL 36532073_08c.eps
141003

Layout TV Board (13”/15”) (Part 4 Bottom Side)

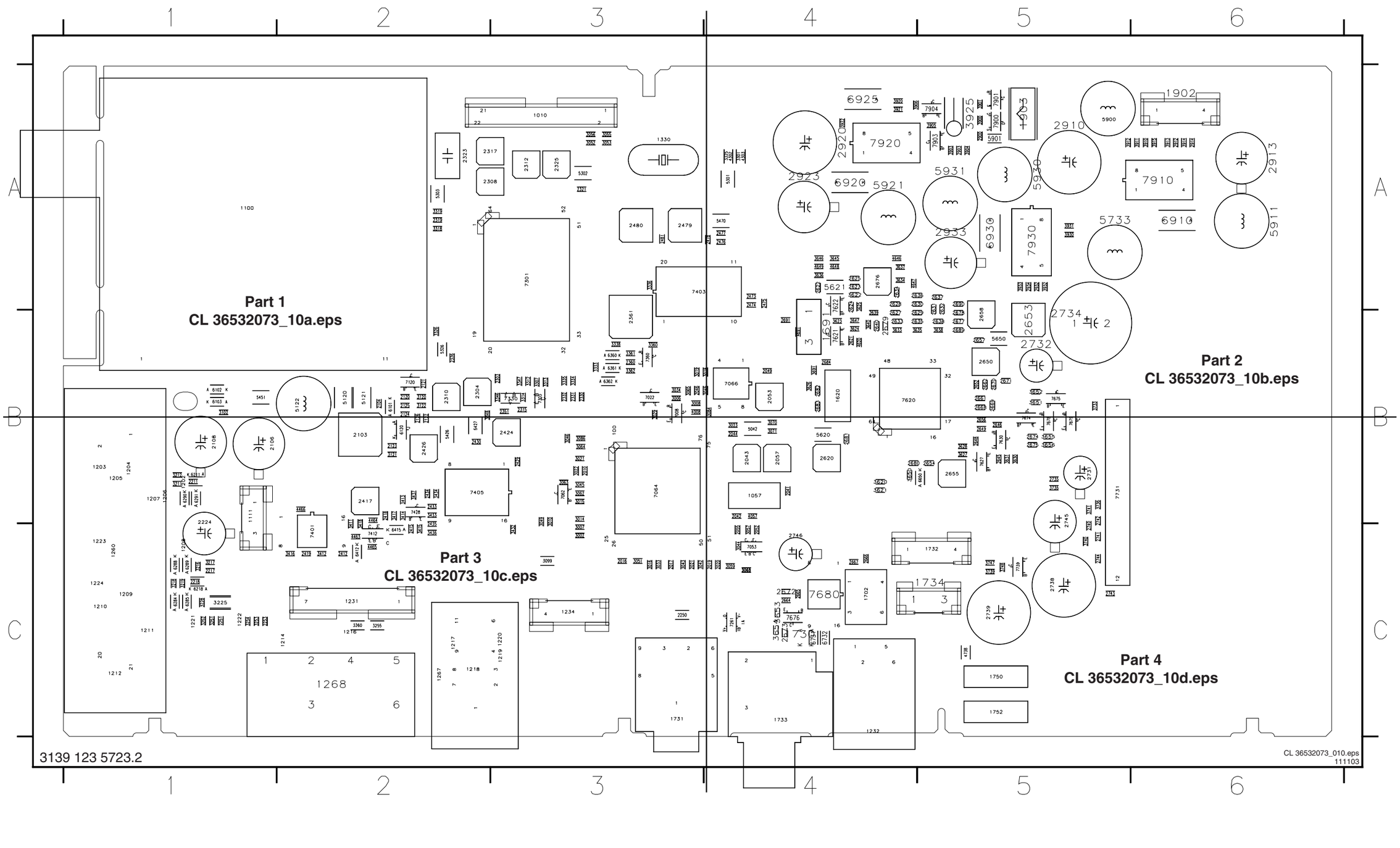


Part 4 of
3139 123 5712.2

CL 36532073_08d.eps
141003

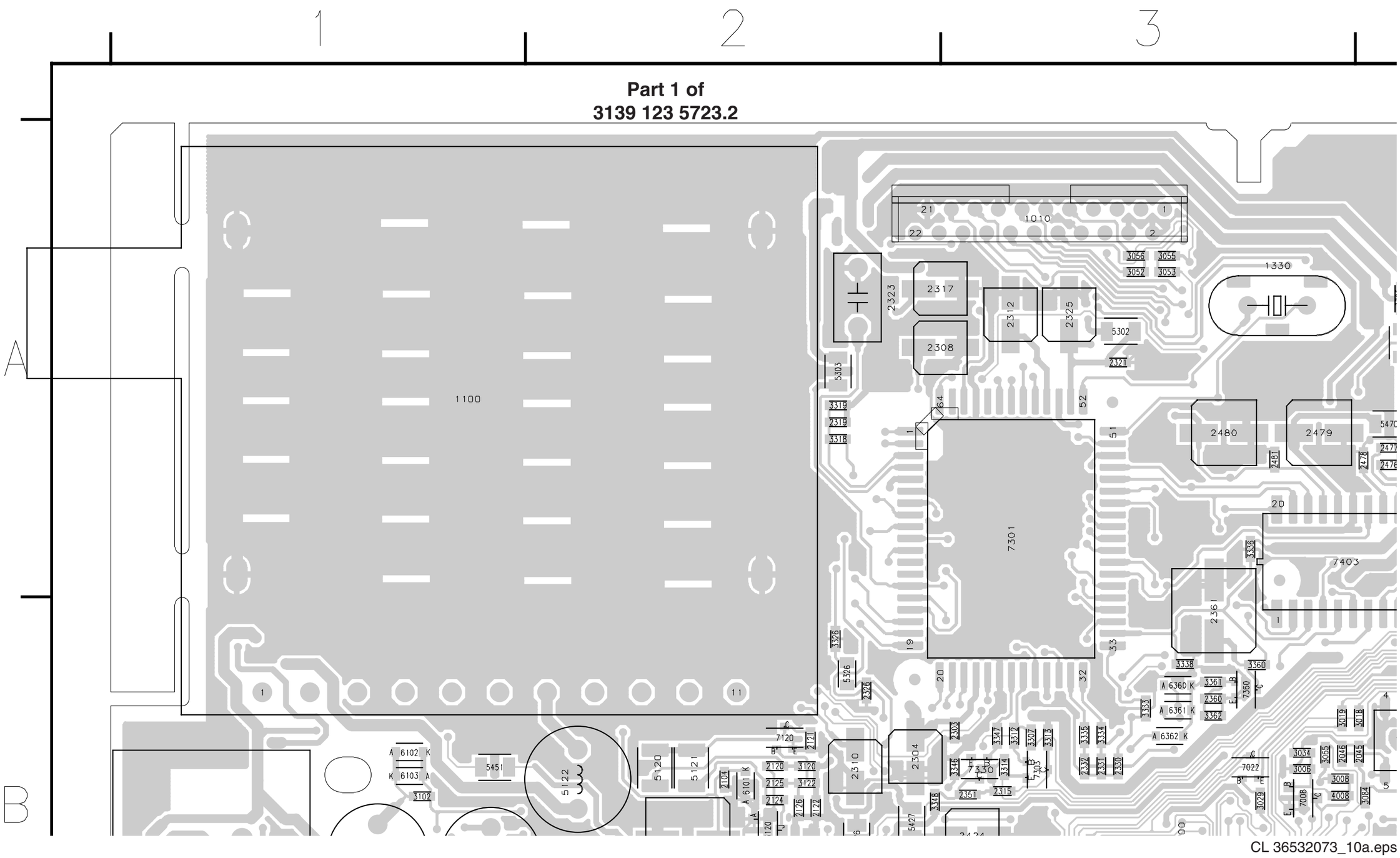
Layout TV Board (20") (Overview Top Side)

1010	A3	1731	C3	2043	B4	2125	B2	2330	B3	2448	B2	2628	A4	2650	B5	2672	C4	2735	B5	2923	A4	3023	B4	3062	B3	3219	C1	3336	A3	3433	B2	3645	A4	3900	A5	3932	A5	4691	B4	5900	A5	6360	B3	7120	B2	7679	B5
1057	B4	1732	C5	2044	B4	2126	B2	2331	B3	2449	B2	2629	B5	2652	B5	2673	C4	2738	C5	2932	A5	3029	B3	3063	B3	3225	C1	3337	A3	3434	B2	3646	A4	3901	A5	3933	A5	4738	C5	5901	A5	6361	B3	7261	C4	7680	C4
1100	A1	1733	C4	2045	B4	2211	B1	2332	B3	2473	A4	2630	A5	2653	B5	2674	B5	2739	C5	2933	A5	3033	C3	3064	B3	3228	C1	3338	B3	3436	C2	3650	B4	3903	A5	4008	B3	5042	B4	5911	A6	6362	B3	7301	A3	7731	B5
1111	B1	1734	C5	2046	B3	2217	C1	2351	B3	2474	A4	2631	A5	2654	B5	2675	B5	2740	C5	2934	A5	3034	B3	3065	B3	3255	C2	3346	B3	3437	B2	3651	B5	3904	A5	4057	B4	5120	B2	5921	A4	6412	C2	7303	B3	7739	C5
1201	C2	1750	C5	2049	B4	2218	C1	2360	B3	2475	A4	2632	B5	2655	B5	2676	A4	2741	C5	2998	A5	3042	C3	3070	B4	3260	C2	3347	B3	3620	B4	3652	B5	3905	A5	4302	A4	5121	B2	5930	A5	6415	C2	7330	B3	7900	A5
1206	B1	1752	C5	2052	C4	2224	C1	2361	B3	2476	A4	2633	B4	2656	B5	2677	B5	2742	B5	2999	A6	3043	C3	3071	B4	3301	A4	3348	B2	3621	B4	3653	C4	3906	A4	4303	A4	5122	B2	5931	A5	6650	B5	7360	B3	7901	A5
1208	C1	1902	A6	2053	B4	2250	C3	2412	C2	2477	A4	2634	A4	2657	B5	2678	B5	2743	C5	3002	C3	3044	C4	3084	B4	3307	B3	3360	B3	3622	A4	3654	C4	3910	A6	4324	B2	5301	A4	6101	B2	6731	C4	7401	C2	7903	A5
1231	C2	1903	A5	2055	C4	2303	B3	2415	C2	2478	A4	2635	B5	2658	B5	2679	B4	2744	C5	3006	B3	3045	B3	3086	B3	3312	B3	3361	B3	3623	B4	3655	B5	3911	A6	4325	B2	5302	A3	6102	B1	6732	C4	7403	A3	7904	A5
1232	C4	1904	A5	2057	B4	2304	B2	2417	B2	2479	A3	2636	A5	2661	B5	2680	B4	2745	B5	3007	C3	3046	B3	3099	C3	3313	B3	3362	B3	3624	B4	3656	B5	3912	A5	4449	B2	5303	A2	6103	B1	6910	A6	7405	B2	7910	A6
1234	C3	2010	B3	2103	B2	2308	A2	2418	B2	2480	A3	2637	A5	2662	B5	2681	B4	2746	C4	3008	B3	3049	B3	3102	B1	3314	B3	3411	C2	3625	A4	3691	B4	3913	A6	4463	C2	5326	B2	6120	B2	6920	A4	7412	C2	7920	A4
1260	C1	2016	C3	2104	B2	2310	B2	2419	C2	2481	A3	2638	B5	2664	C4	2682	B4	2799	B5	3010	B3	3051	C3	3120	B2	3318	A2	3412	C2	3626	B4	3733	B5	3914	A6	4464	B2	5426	B2	6211	B1	6925	A4	7428	B2	7930	A5
1267	C3	2017	C3	2106	B1	2312	A3	2424	B3	2620	B4	2639	B4	2665	C4	2683	B4	2900	A5	3014	B3	3052	A3	3121	B2	3319	A2	3413	B2	3633	B4	3735	B5	3915	A6	4465	C2	5427	B2	6218	C1	6930	A5	7620	B4		
1269	C2	2018	C4	2108	B1	2315	B3	2426	B2	2621	B4	2640	B4	2666	C4	2684	B4	2903	A5	3015	B3	3053	A3	3122	B2	3325	A4	3414	B2	3634	A4	3736	B5	3920	A4	4466	B2	5451	B1	6284	C1	7008	B3	7621	B4		
1330	A3	2019	C4	2120	B2	2317	A2	2429	B3	2622	A4	2645	B5	2667	C4	2689	B5	2910	A5	3016	C3	3055	A3	3211	B1	3326	B2	3415	C2	3635	B5	3739	C5	3921	A4	4620	B4	5470	A4	6285	C1	7022	B3	7622	A4		
1620	B4	2020	C4	2121	B2	2319	A2	2430	B2	2623	A4	2646	B5	2668	B5	2690	A5	2912	A6	3018	B4	3056	A3	3212	B1	3329	A2	3416	C2	3636	A4	3740	C5	3922	A4	4646	A4	5620	B4	6288	C1	7053	C4	7674	B5		
1691	B4	2021	C3	2122	B2	2321	A3	2433	B2	2624	A4	2647	B4	2669	B5	2691	B4	2913	A6	3019	B3	3057	C4	3216	C1	3333	B3	3417	B2	3637	A4	3741	B5	3925	A5	4647	A4	5621	A4	6289	C1	7062	B3	7675	B5		
1702	C4	2041	B4	2123	B2	2325	A3	2434	B2	2625	A4	2648	B5	2670	B5	2732	B5	2914	A6	3021	B3	3059	C4	3217	C1	3334	B3	3418	C2	3638	B5	3747	C5	3930	A5	4648	A4	5650	B5	6290	B1	7064	B3	7676	C4		
1730	C4	2042	B4	2124	B2	2326	B2	2435	C2	2627	B4	2649	B5	2671	B5	2734	B5	2920	A4	3022	B3	3060	C4	3218	C1	3335	B3	3432	C3	3640	B4	3748	C5	3931	A5	4649	A4	5733	A5	6291	B1	7066	B4	7678	B5		



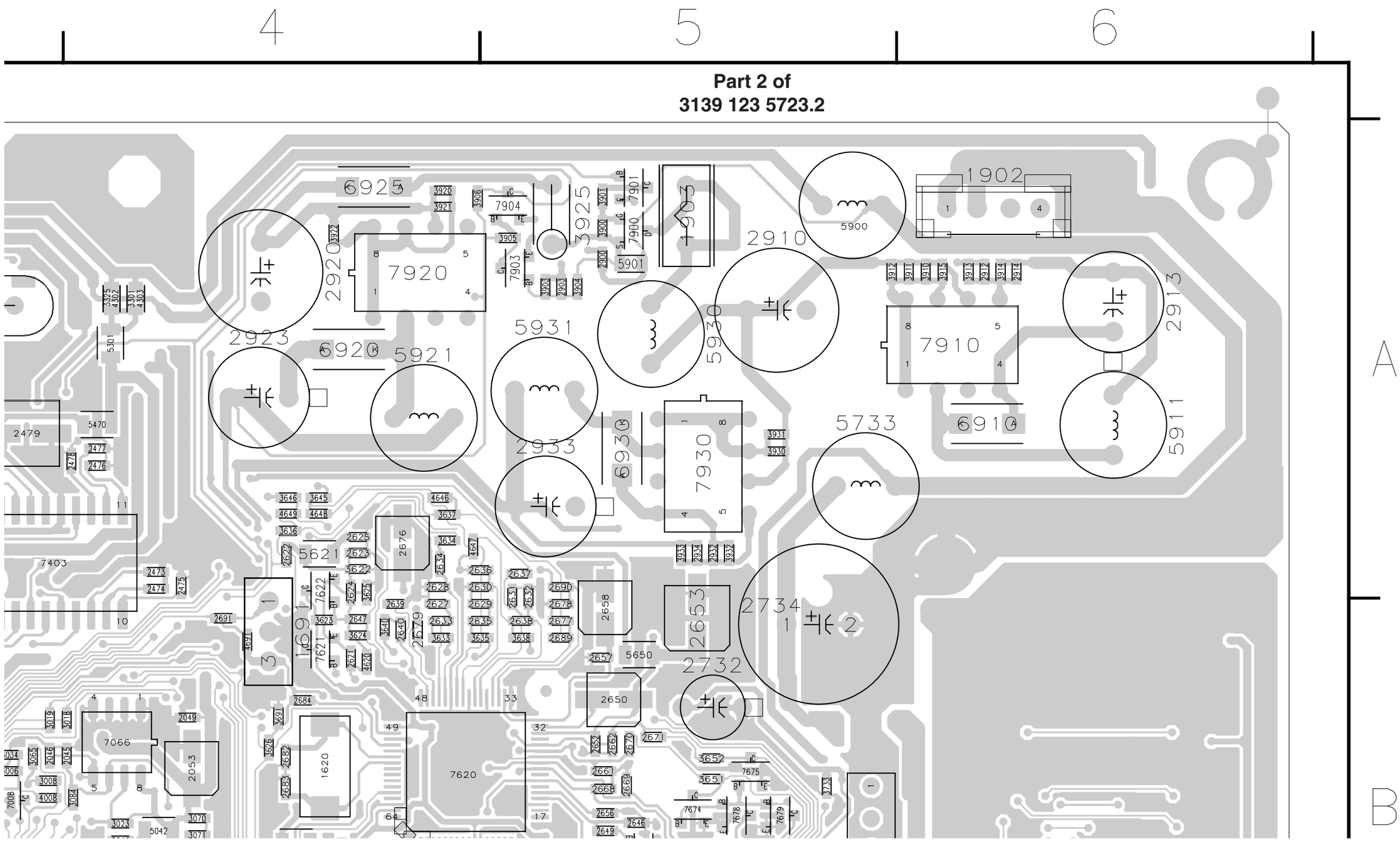
Layout TV Board (20") (Part 1 Top Side)

Part 1 of
3139 123 5723.2



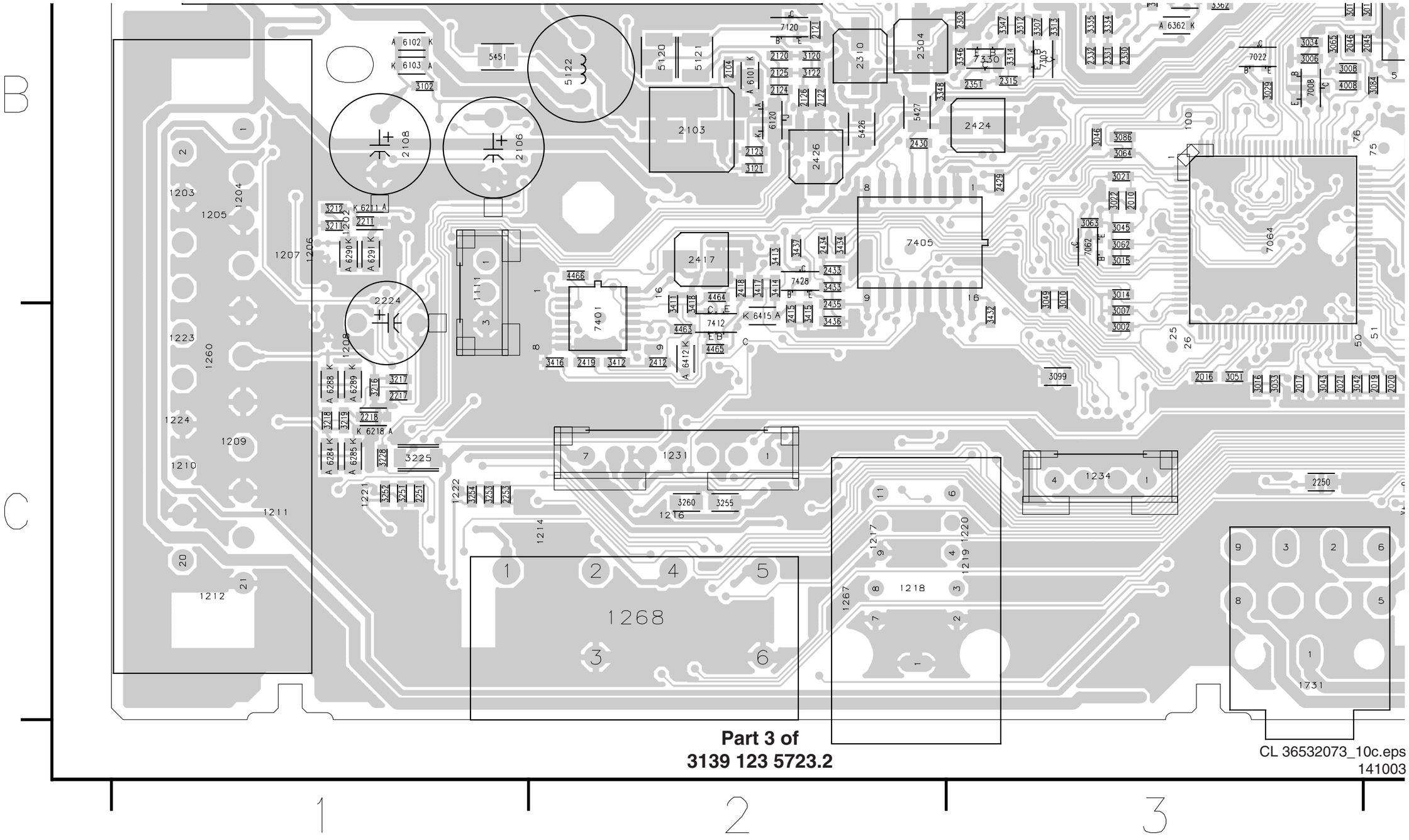
Layout TV Board (20") (Part 2 Top Side)

Part 2 of
3139 123 5723.2

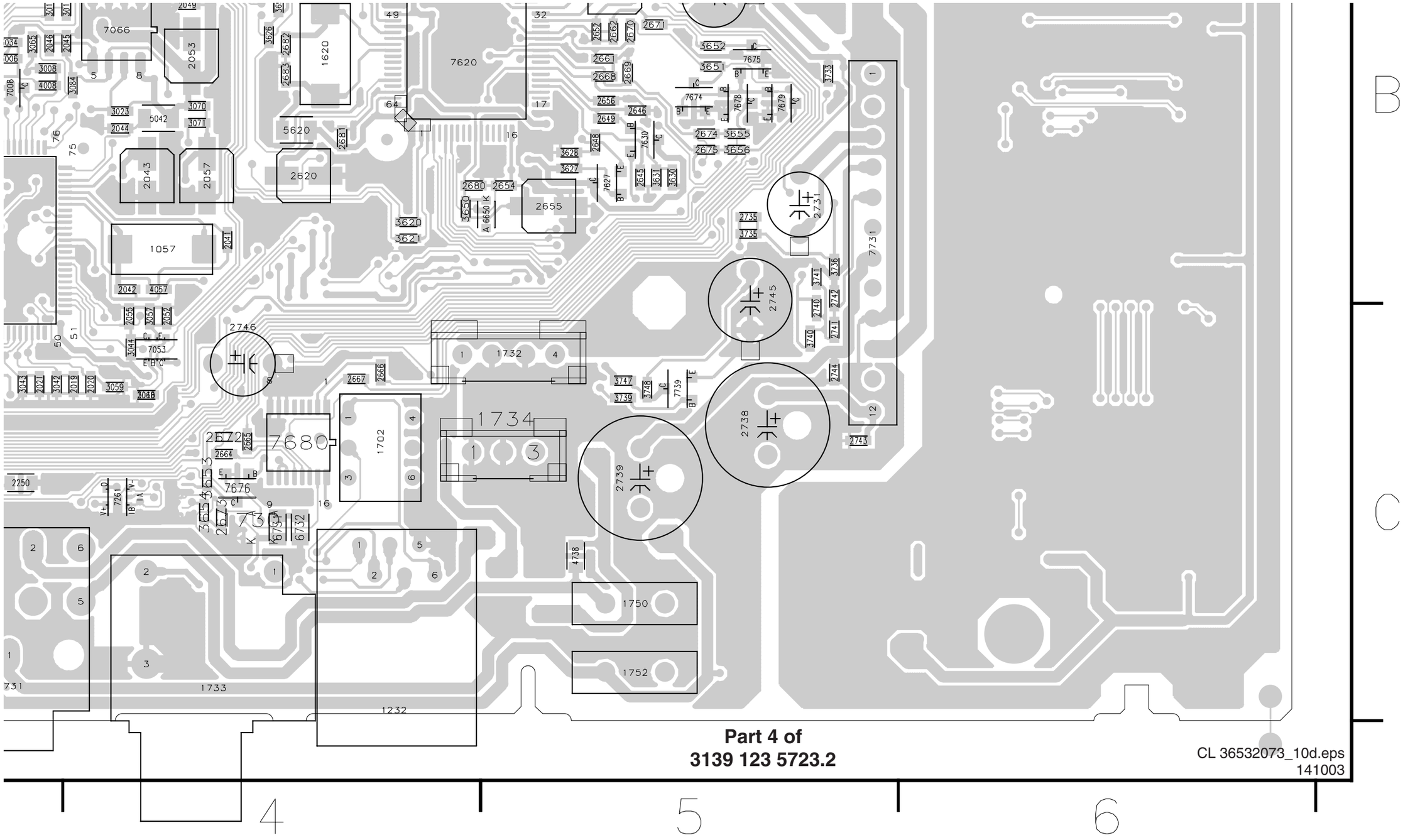


CL 36532073_10b.eps
141003

Layout TV Board (20") (Part 3 Top Side)



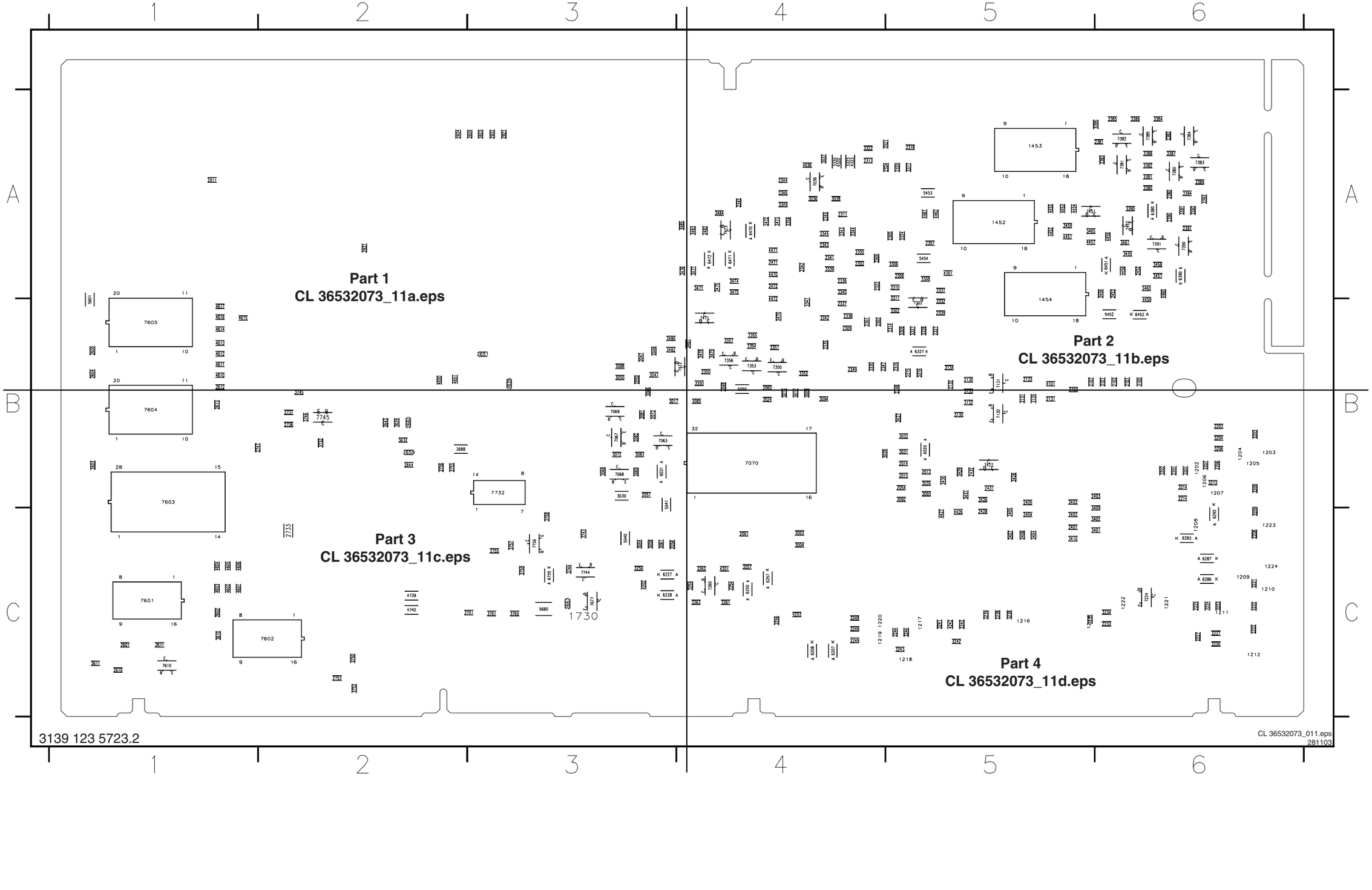
Layout TV Board (20") (Part 4 Top Side)



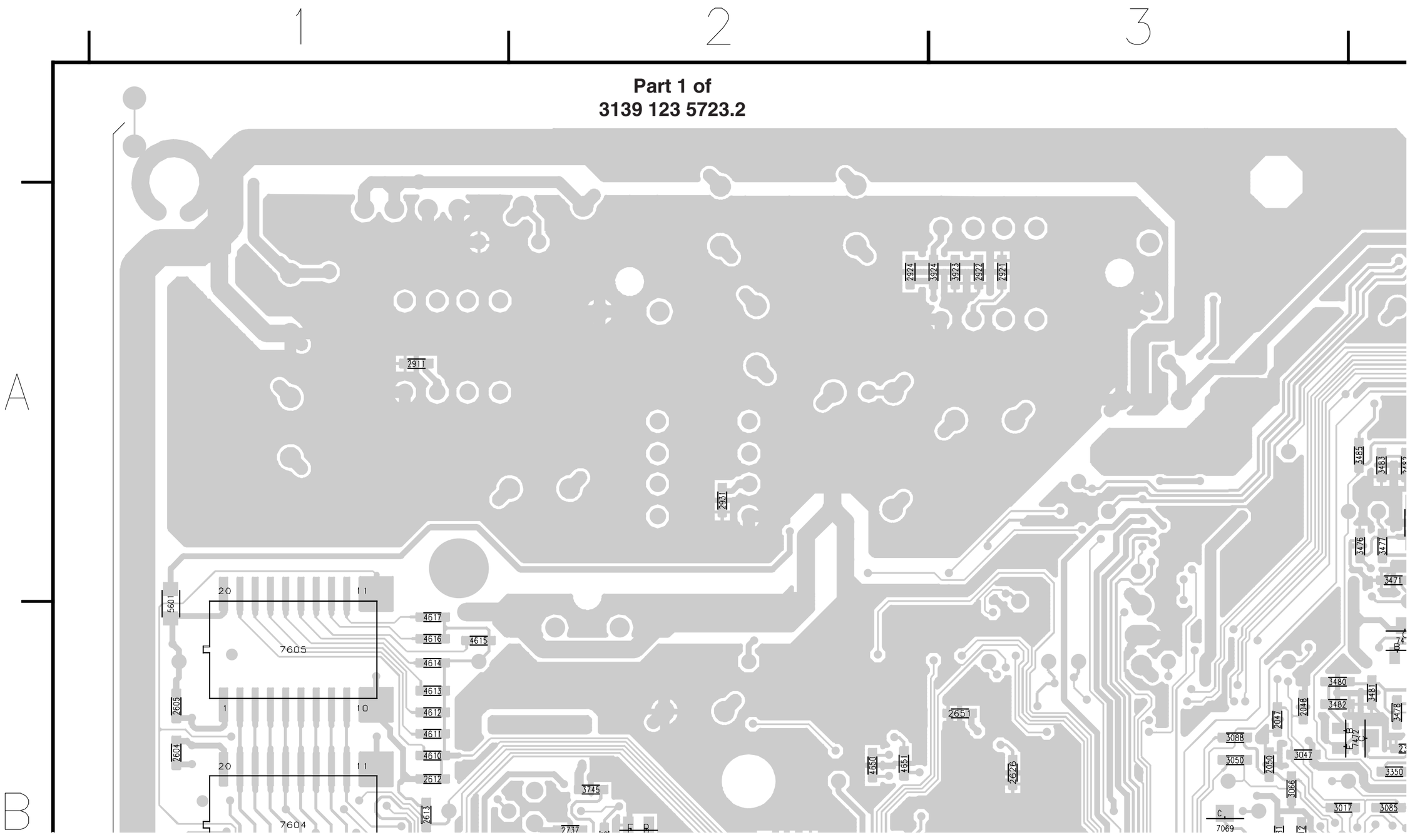
Part 4 of
3139 123 5723.2

CL 36532073_10d.eps
141003

Layout TV Board (20") (Overview Bottom Side)



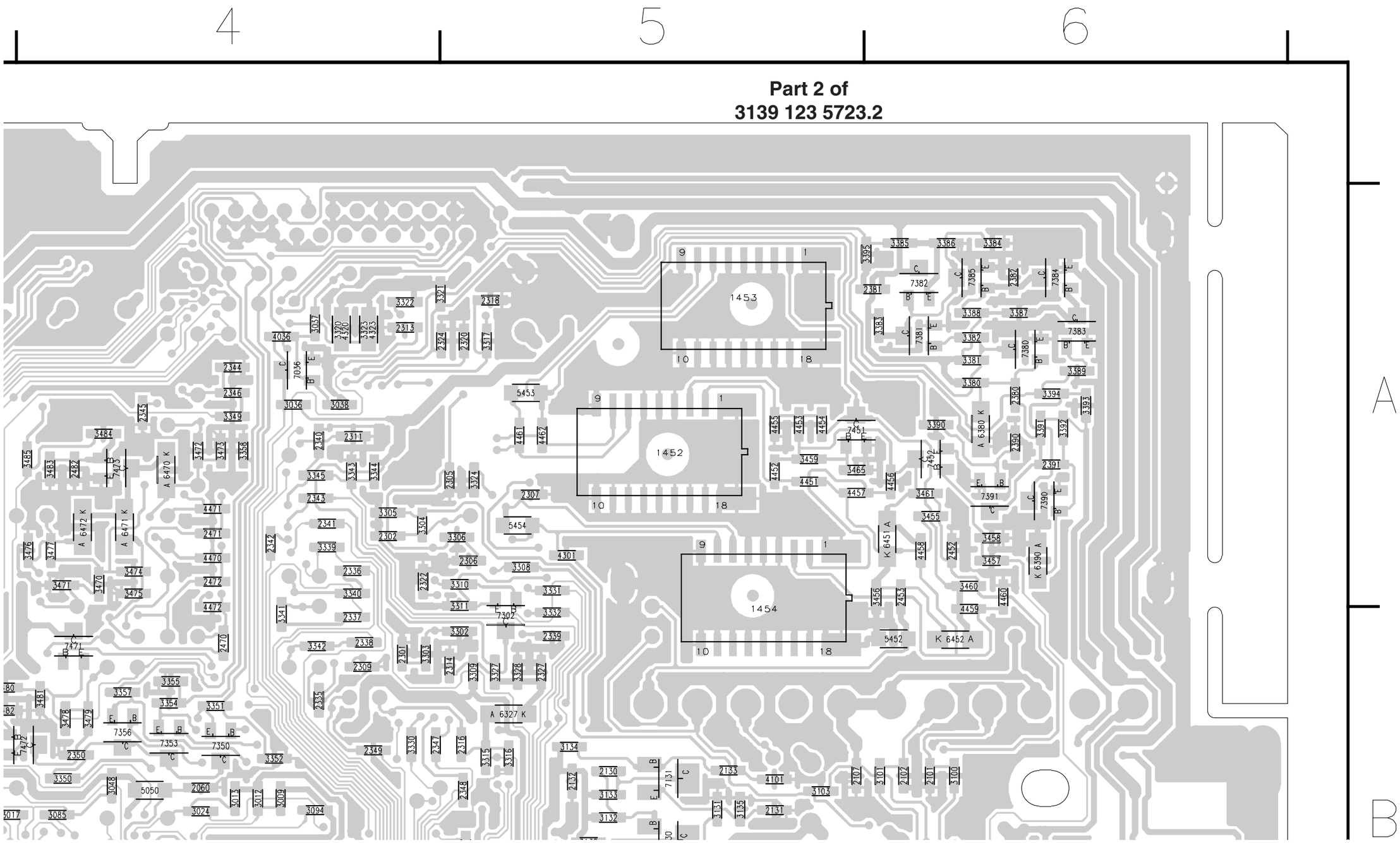
Layout TV Board (20") (Part 1 Bottom Side)



CL 36532073_11a.eps
141003

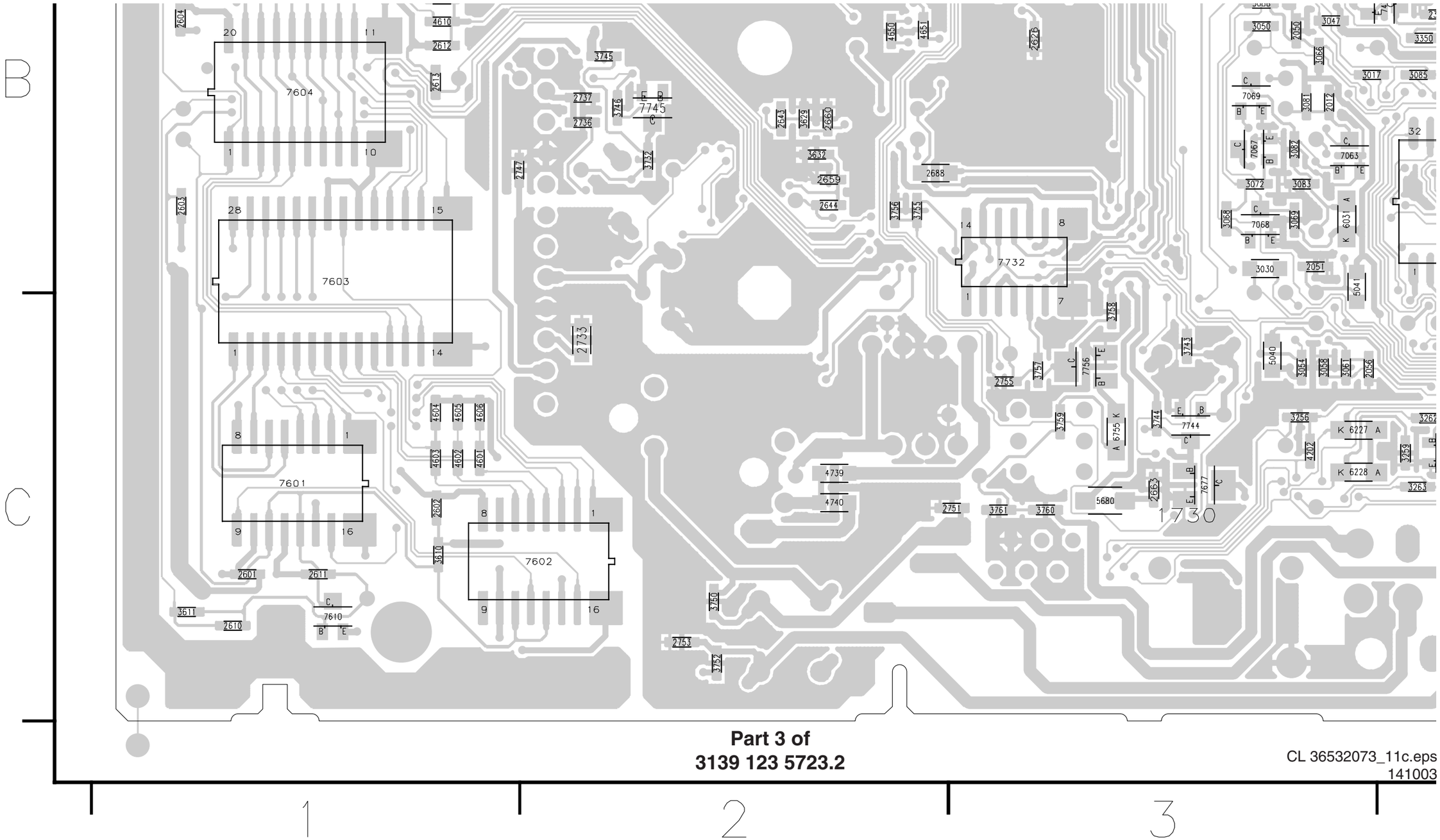
Layout TV Board (20") (Part 2 Bottom Side)

Part 2 of
3139 123 5723.2



CL 36532073_11b.eps
141003

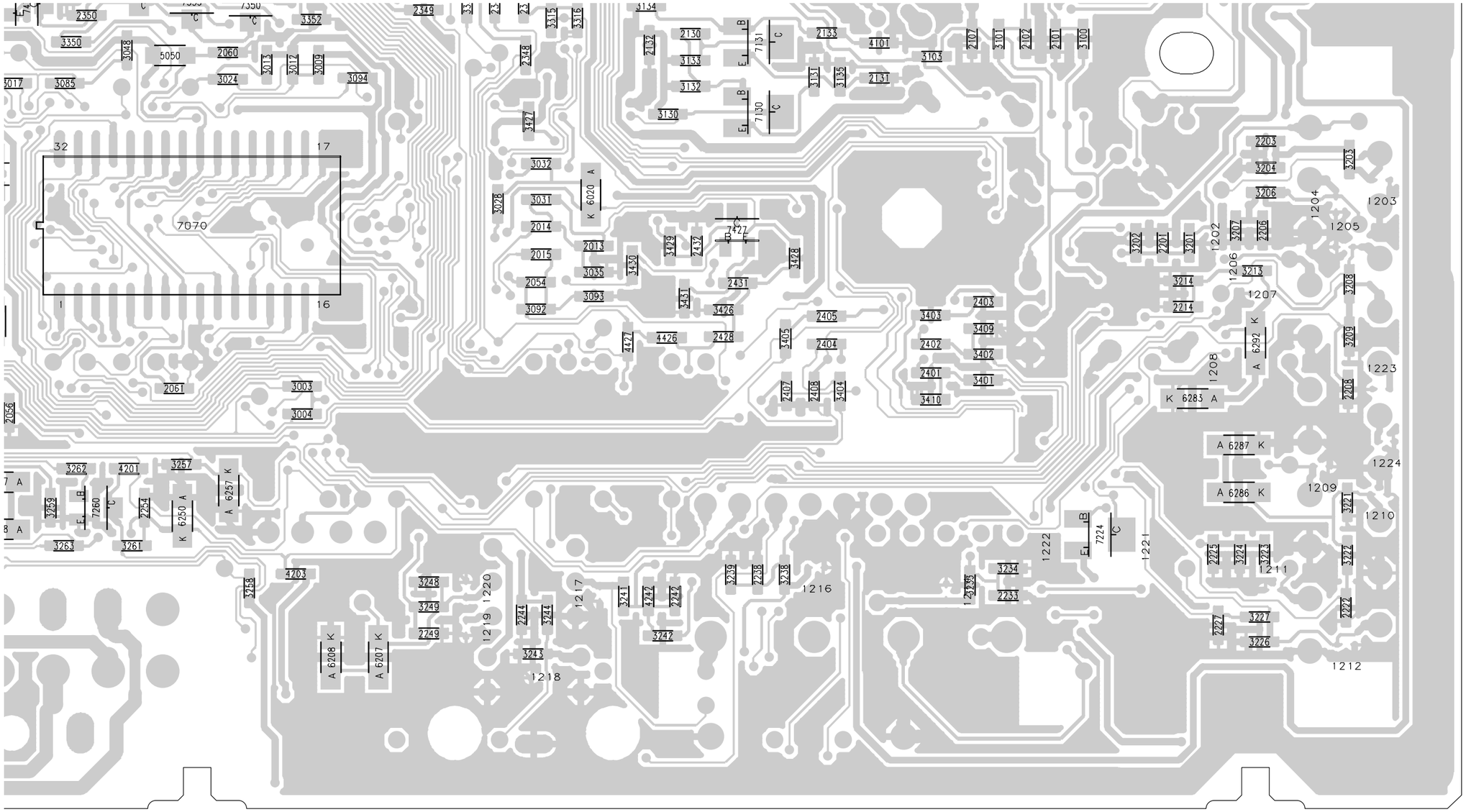
Layout TV Board (20") (Part 3 Bottom Side)



Part 3 of
3139 123 5723.2

CL 36532073_11c.eps
141003

Layout TV Board (20") (Part 4 Bottom Side)



Part 4 of
3139 123 5723.2

CL 36532073_11d.eps
141003

Scaler Board: Power

C 1 POWER

1. Trace (except pin 5) both 7003 should be thick and short .
2. Keep loop area around IC very small .
3. All devices should be placed as close as possible to the IC .

@ DIVERSITY

REF	13"	15"/17"	20"/23"
3014	10K	--	--
3015	--	10K	10K
3016	1R	10K	10K
3019	--	--	1K4,1%
3020	--	--	12K,1%
5010	Yes	Yes	--
5011	--	--	Yes
5013	--	Yes	--
5014	--	--	Yes
6001	BZX384-C15	BZX384-C15	BZX384-C27
7005	SI9433DY	SI9433DY	SI4431DY

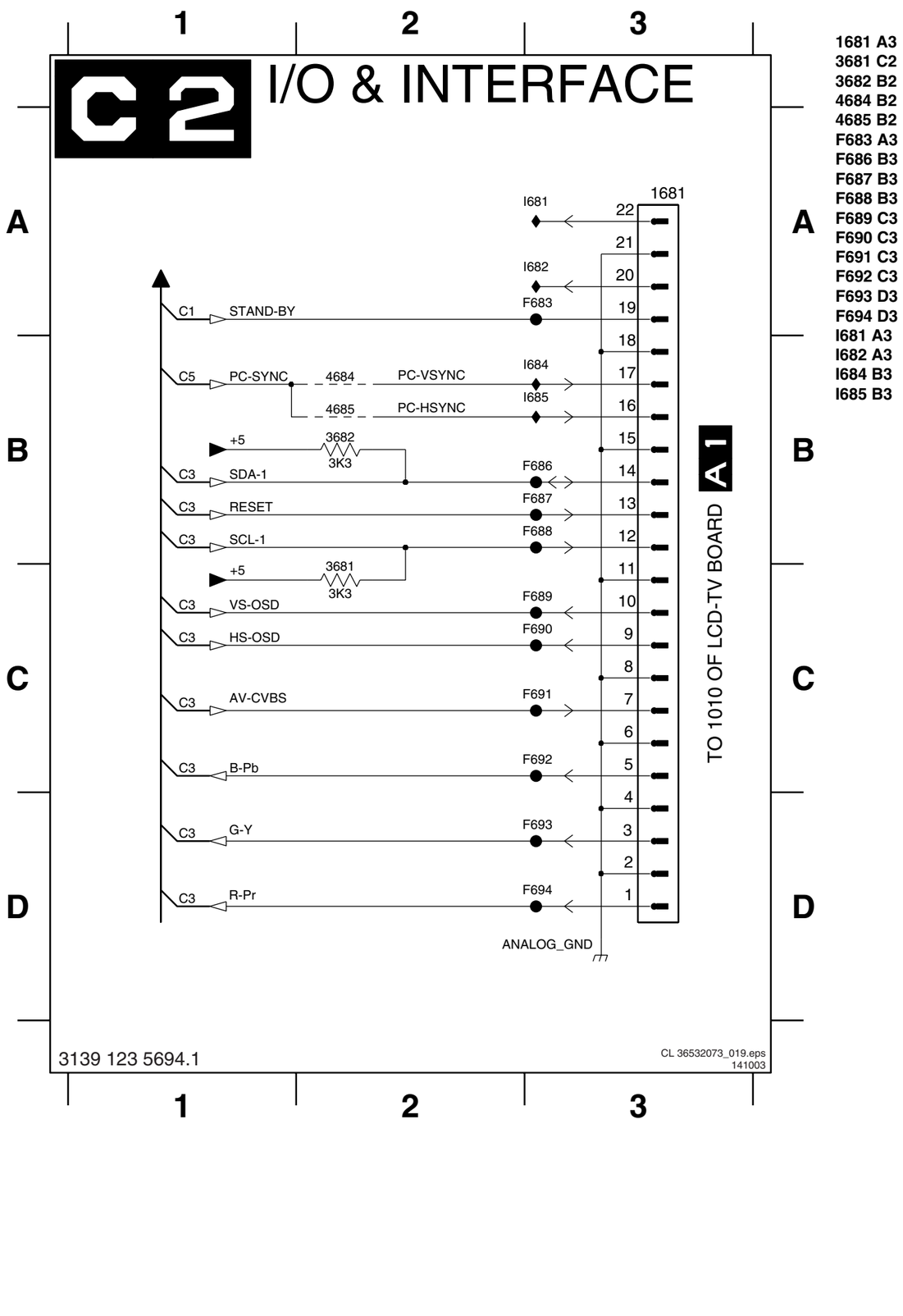
F009 = 3V3 DC
F011 = 12V DC
F012 = 5V DC
F013 = 1V8 DC

3139 123 5694.1

CL 36532073_018.eps
021203

0121 F3	F024 A3	3004 F2	5001 E4
0122 F7	I001 F1	3005 E3	5002 E5
1001-1 A1	I002 F2	3006 F3	5003 E8
1001-2 A1	I003 F2	3009 B5	5009 E3
1001-3 A1	I004 B4	3010 B5	5010 B3
1002 A2	I005 E3	3014 B2	5011 B3
1003 A3	I006 D4	3015 C2	5013 B4
2001 A2	I007 E4	3016 C3	5014 B5
2002 E3	I008 E5	3017 C2	5015 B4
2004 D5	I014 E8	3018 C3	5025 B7
2005 F8	I015 B3	3019 B5	5026 C8
2006 E9	I017 B3	3020 C6	6001 F1
2007 E5	I018 C3	5001 E4	6002 E4
2008 E5	I019 B5	5002 E5	6025 B8
2009 E3	I025 B7	5003 E8	7001 E3
2010 B5	I026 C7	5009 E3	7002 F2
2015 F7		5010 B3	7003 E3
2016 F6		5011 B3	7004 C3
2019 C5		5013 B4	7005 B4
2020 C6		5014 B5	7006 E9
2021 C4		5015 B4	7009 E7
2024 D3		5025 B7	7010 A6
2025 B7		5026 C8	7011 D5
2026 C7		6001 F1	F009 E7
2027 C8		6002 E4	F010 D5
2028 D4		6025 B8	F011 C8
2030 A2		7001 E3	F012 E5
2031 B3		7002 F2	F013 E9
2032 A1		7003 E3	F020 A1
2033 A2		7004 C3	F021 A1
3001 F1		7005 B4	F022 A1
3002 F2		7006 E9	F023 A3
3003 F1		7009 E7	

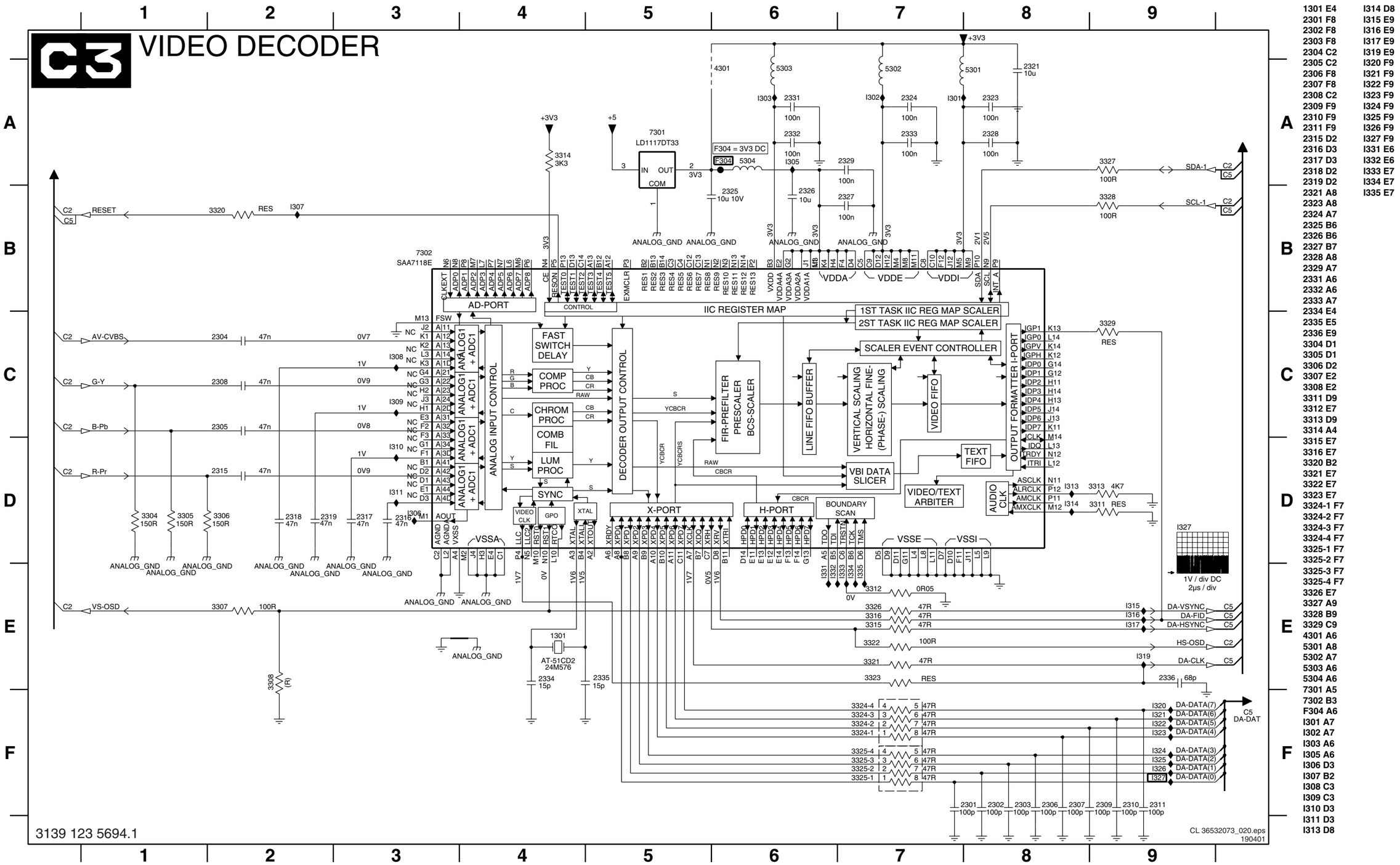
Scaler Board: I/O & Interface



1681 A3
3681 C2
3682 B2
4684 B2
4685 B2
F683 A3
F686 B3
F687 B3
F688 B3
F689 C3
F690 C3
F691 C3
F692 C3
F693 D3
F694 D3
I681 A3
I682 A3
I684 B3
I685 B3

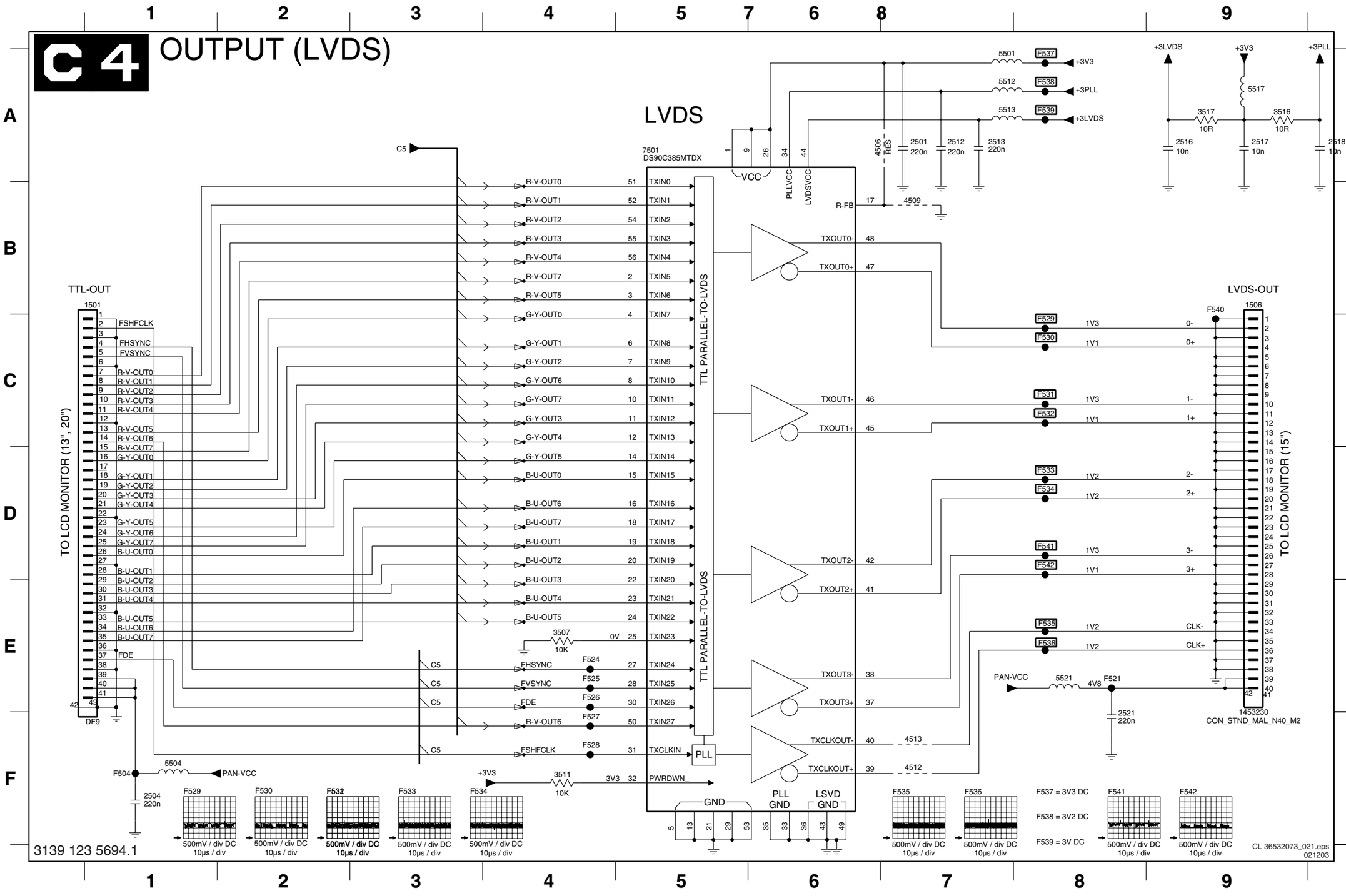
Personal Notes:

Scaler Board: Video Decoder



1301 E4	I314 D8
2301 F8	I315 E9
2302 F8	I316 E9
2303 F8	I317 E9
2304 C2	I319 E9
2305 C2	I320 F9
2306 F8	I321 F9
2307 F8	I322 F9
2308 C2	I323 F9
2309 F9	I324 F9
2310 F9	I325 F9
2311 F9	I326 F9
2315 D2	I327 F9
2316 D3	I331 E6
2317 D3	I332 E6
2318 D2	I333 E7
2319 D2	I334 E7
2321 A8	I335 E7
2323 A8	
2324 A7	
2325 B6	
2326 B6	
2327 B7	
2328 A8	
2329 A7	
2331 A6	
2332 A6	
2333 A7	
2334 E4	
2335 E5	
2336 E9	
3304 D1	
3305 D1	
3306 D2	
3307 E2	
3308 E2	
3311 D9	
3312 E7	
3313 D9	
3314 A4	
3315 E7	
3316 E7	
3320 B2	
3321 E7	
3322 E7	
3323 E7	
3324-1 F7	
3324-2 F7	
3324-3 F7	
3324-4 F7	
3325-1 F7	
3325-2 F7	
3325-3 F7	
3325-4 F7	
3326 E7	
3327 A9	
3328 B9	
3329 C9	
4301 A6	
5301 A8	
5302 A7	
5303 A6	
5304 A6	
7301 A5	
7302 B3	
F304 A6	
I301 A7	
I302 A7	
I303 A6	
I305 A6	
I306 D3	
I307 B2	
I308 C3	
I309 C3	
I310 D3	
I311 D3	
I313 D8	

Scaler Board: Output (LVDS)



1501 B1
1506 B9
2501 A7
2504 F1
2512 A7
2513 A7
2516 A9
2517 A9
2521 E8
3507 E4
3511 F4
3516 A9
3517 A9
4506 A6
4509 B7
4512 F7
4513 F7
5501 A7
5504 F1
5512 A7
5513 A7
5517 A9
5521 E8
7501 A5
F504 F1
F521 E8
F524 E4
F525 E4
F526 E4
F527 F4
F528 F4
F529 C8
F530 C8
F531 C8
F532 C8
F533 D8
F534 D8
F535 E8
F536 E8
F537 A8
F538 A8
F539 A8
F540 B9
F541 D8
F542 D8

Scaler Board: Video Converter

C5 VIDEO CONVERTER

SDRAM 2M x 32

TO INVERTER

INVERTER_GND

7351 Farouja_s2300

7352 K4S643232E-TC50

{DATA(0:31)}

{ADDR(0:10)}

{DA-DATA(0:7)}

C3

C4

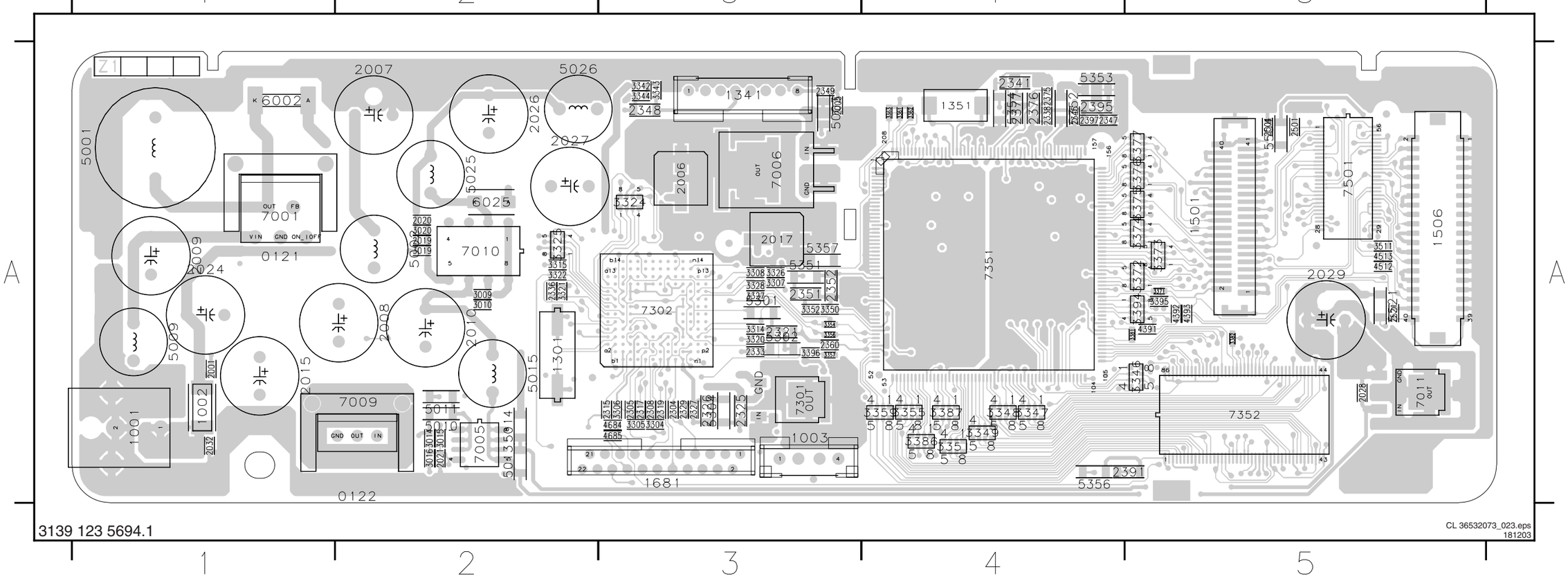
3139 123 5694.1

CL 36532073_022.eps 021203

1341 A10
1351 G1
2338 I14
2339 I14
2340 A9
2341 I13
2342 I13
2343 I13
2344 I1
2345 H13
2346 I13
2347 H13
2348 A9
2349 A9
2351 H1
2352 H1
2353 H1
2354 H2
2355 H2
2356 G2
2357 H2
2358 G2
2359 H3
2360 E2
2361 I1
2362 I1
2363 I2
2364 I2
2365 I2
2366 H3
2367 H3
2368 H3
2369 H4
2371 I3
2372 I3
2373 I3
2374 I3
2375 H5
2376 H5
2377 H6
2378 I7
2379 H6
2381 A14
2382 A14
2383 A14
2384 A14
2385 A13
2386 A13
2387 A13
2388 A12
2389 A12
2391 A11
2392 A11
2393 A11
2394 A10
2395 H13
2396 G13
2397 H13
3342 A8
3343 A9
3344 A8
3346-1 D7
3346-2 D7
3346-3 D7
3346-4 D7
3347-1 C7
3347-2 C7
3347-3 C7
3347-4 C7
3348-1 C7
3348-2 C7
3348-3 C7
3348-4 C7
3349-1 C7
3349-2 C7
3349-3 C7
3349-4 C7
3350 D2
3351-1 C7
3351-2 C7
3351-3 B7
3351-4 B7
3352 D2
3353 C2
3354 D2
3355-1 B7
3355-2 B7
3355-3 B7
3355-4 B7
3356 D2
3357 D2
3358 C2
3359-1 A7
3359-2 A7
3359-3 A7
3359-4 A7
3360 D7
3361 F1
3362 F2
3363 F2
3364 G1
3365 H6
3366 I6
3367 H7
3368 H8
3369 G3
3370 D7
3371 E7
3372-1 E11
3372-2 E11
3372-3 F11
3372-4 F11
3373-1 F11
3373-2 F11
3373-3 F11
3373-4 F11
3374-1 G11
3374-2 G11
3374-3 G11
3374-4 G11
3375-1 H11
3375-2 H11
3375-3 H11
3375-4 H11
3376-1 H11
3376-2 H11
3376-3 I11
3376-4 I11
3377-1 I11
3377-2 I11
3377-3 I11
3377-4 I11
3378 E11
3379 D7
3380 D7
3381 C10
3382 D10
3383 D7
3384 D7
3385 D7
3386-1 B7
3386-2 B7
3386-3 B7
3386-4 B7
3387-1 B7
3387-2 B7
3387-3 B7
3387-4 B7
3388 I6
3389 I6
3391 I6
3394-1 A6
3394-2 A6
3394-3 A6
3394-4 A6
3395 A6
3396 D1
4391 A7
4392 A7
4393 E8
5351 H1
5352 F12
5353 H12
5354 I12
5355 A13
5356 A11
5357 I1
7351 C5
7352 B11
F341 A10
F342 A10
F343 A10
F345 A10
F347 I11
F348 I11
F349 I11
F378 E11
F379 E11
F380 F11
F381 F11
F382 F11
F383 F11
F384 F11
F385 F11
F386 G11
F387 G11
F388 G11
F390 G11
F391 H11
F392 H11
F393 H11
F394 H11
F395 H11
F396 I11
F397 I11
F398 I11
F399 I11
I344 F13
I345 G13
I346 I13
I347 H7
I348 G1
I349 H1
I350 D2
I351 A12
I352 D2
I353 A12
I355 D3
I357 D3
I358 F1
I359 D3
I361 I1
I362 I6
I363 I6
I364 I6
I365 I6
I371 C10
I373 D10
I374 D11
I375 D10
I377 C10

Layout Scaler Board (Top Side)

0121 A1
0122 A2
1001 A1
1002 A1
1003 A3
1301 A2
1341 A3
1351 A4
1501 A5
1506 A5
1681 A3
2001 A1
2005 A3
2006 A3
2007 A2
2008 A2
2009 A1
2010 A2
2015 A1
2017 A3
2019 A2
2020 A2
2021 A2
2024 A1
2026 A2
2027 A2
2028 A5
2029 A5
2032 A1
2304 A3
2305 A3
2308 A3
2315 A3
2317 A3
2319 A3
2321 A3
2325 A3
2326 A3
2327 A3
2329 A3
2333 A3
2336 A2
2338 A4
2341 A4
2345 A4
2347 A4
2348 A3
2349 A3
2351 A3
2352 A3
2360 A3
2375 A4
2376 A4
2377 A4
2391 A5
2395 A4
2397 A4
2501 A5
2504 A5
2521 A5
3009 A2
3010 A2
3014 A2
3015 A2
3016 A2
3019 A2
3020 A2
3304 A3
3305 A3
3306 A3
3307 A3
3308 A3
3314 A3
3315 A2
3320 A3
3321 A2
3322 A2
3324 A3
3325 A2
3326 A3
3327 A3
3328 A3
3343 A3
3344 A3
3346 A5
3347 A4
3348 A4
3349 A4
3350 A3
3351 A4
3352 A3
3354 A3
3355 A4
3356 A3
3357 A3
3359 A4
3361 A4
3362 A4
3363 A4
3371 A5
3372 A5
3373 A5
3374 A5
3375 A5
3376 A5
3377 A5
3381 A5
3382 A5
3386 A4
3387 A4
3394 A5
3395 A5
3396 A3
3511 A5
4391 A5
4392 A5
4393 A5
4512 A5
4513 A5
4684 A3
4685 A3
5001 A1
5002 A2
5003 A3
5009 A1
5010 A2
5011 A2
5013 A2
5014 A2
5015 A2
5025 A2
5026 A2
5301 A3
5302 A3
5304 A3
5351 A3
5352 A4
5353 A4
5354 A4
5356 A4
5357 A3
5504 A5
5521 A5
6002 A1
6025 A2
7001 A1
7005 A2
7006 A3
7009 A2
7010 A2
7011 A5
7301 A3
7302 A3
7351 A4
7352 A5
7501 A5



3139 123 5694.1

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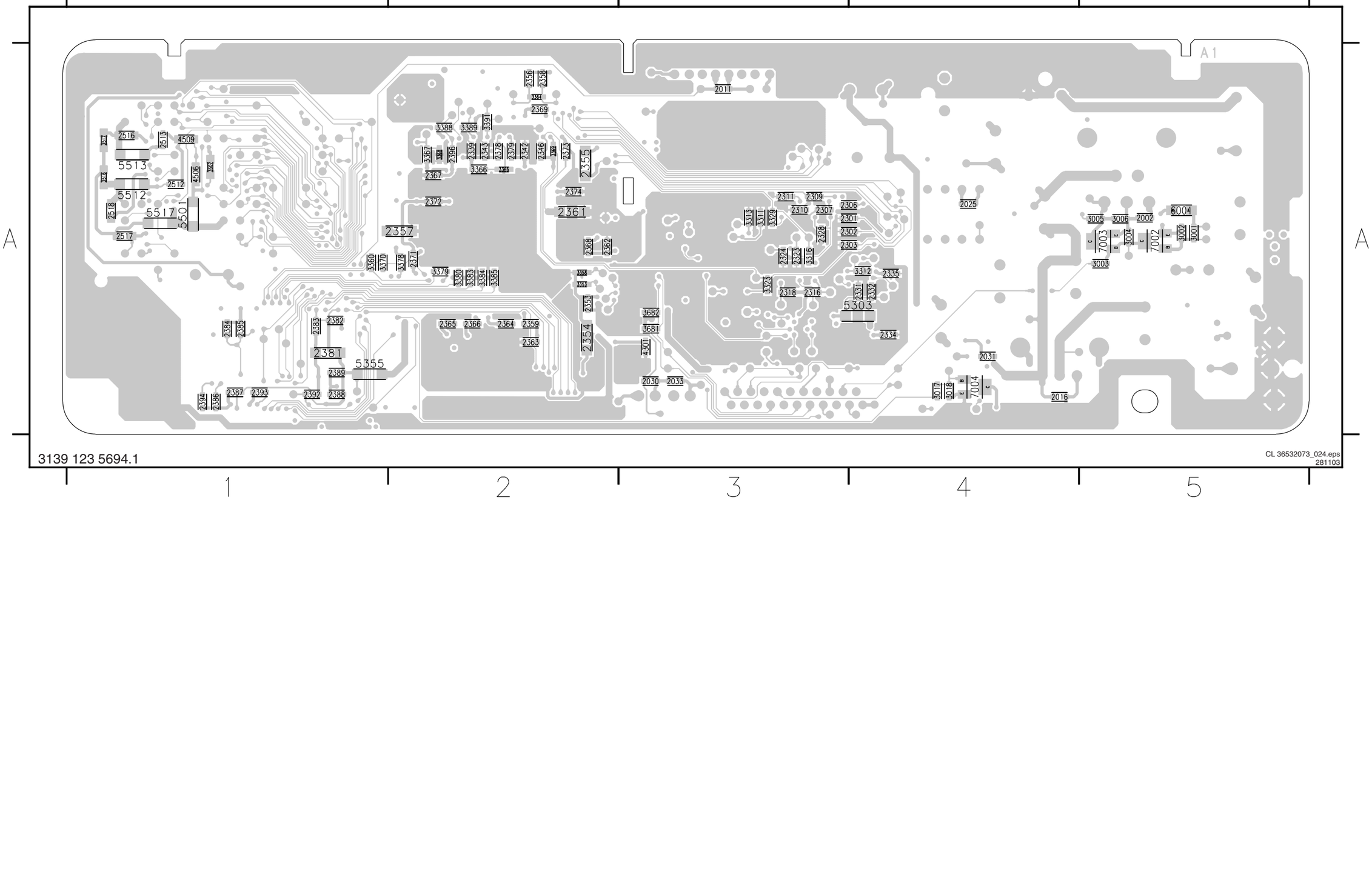
181203

Layout Scaler Board (Bottom Side)

2002 A5	2302 A4	2318 A3	2339 A2	2357 A2	2366 A2	2378 A2	2387 A1	2513 A1	3005 A5	3323 A3	3367 A2	3384 A2	3681 A3	5512 A1
2011 A3	2303 A4	2323 A3	2342 A2	2358 A2	2367 A2	2379 A2	2388 A1	2516 A1	3006 A5	3329 A3	3368 A2	3385 A2	3682 A3	5513 A1
2016 A4	2306 A4	2324 A3	2343 A2	2359 A2	2368 A2	2381 A1	2389 A1	2517 A1	3017 A4	3353 A2	3369 A2	3388 A2	4301 A3	5517 A1
2025 A4	2307 A3	2328 A3	2346 A2	2361 A2	2369 A2	2382 A1	2392 A1	2518 A1	3018 A4	3358 A2	3370 A1	3389 A2	4506 A1	6001 A5
2030 A3	2309 A3	2331 A4	2353 A2	2362 A2	2371 A2	2383 A1	2393 A1	3001 A5	3311 A3	3360 A1	3378 A2	3391 A2	4509 A1	7002 A5
2031 A4	2310 A3	2332 A4	2354 A2	2363 A2	2372 A2	2384 A1	2394 A1	3002 A5	3312 A4	3364 A2	3379 A2	3507 A1	5303 A4	7003 A5
2033 A3	2311 A3	2334 A4	2355 A2	2364 A2	2373 A2	2385 A1	2396 A2	3003 A5	3313 A3	3365 A2	3380 A2	3516 A1	5355 A1	7004 A4
2301 A4	2316 A3	2335 A4	2356 A2	2365 A2	2374 A2	2386 A1	2512 A1	3004 A5	3316 A3	3366 A2	3383 A2	3517 A1	5501 A1	



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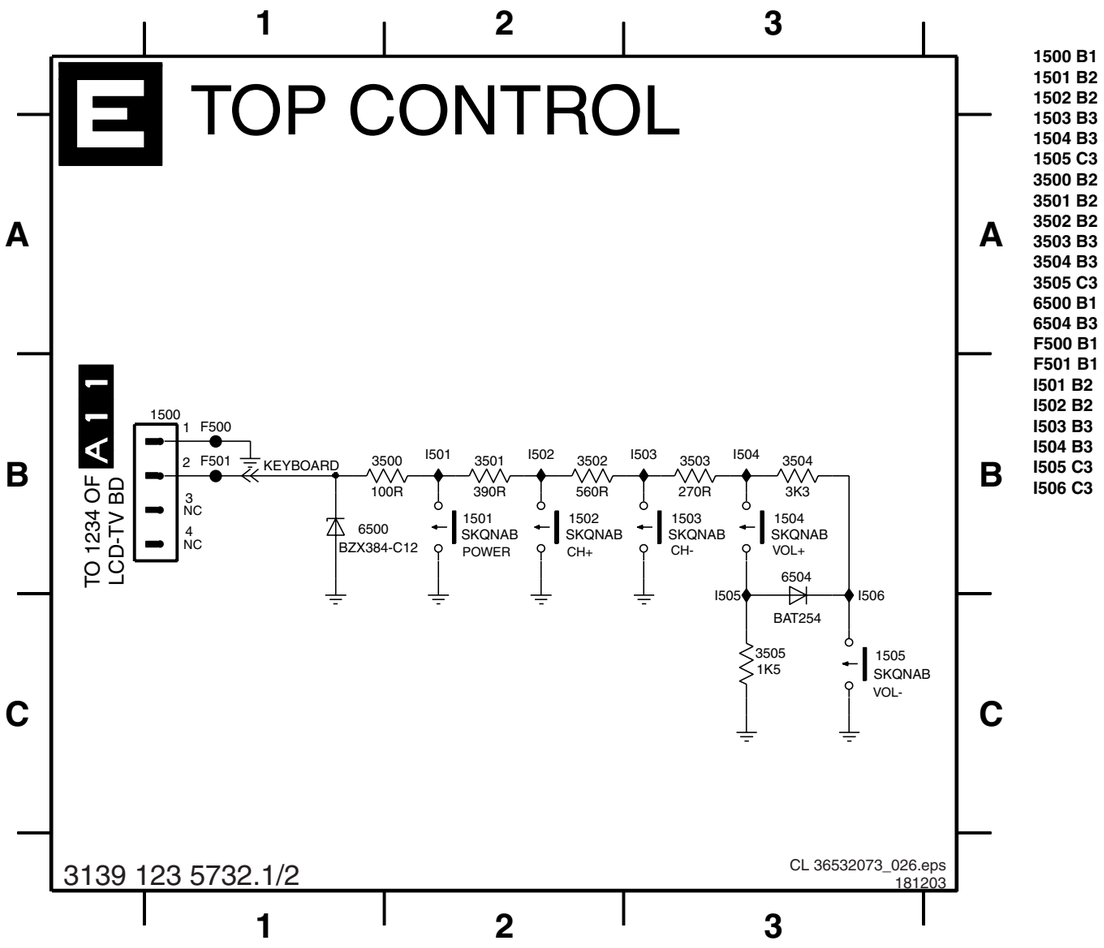
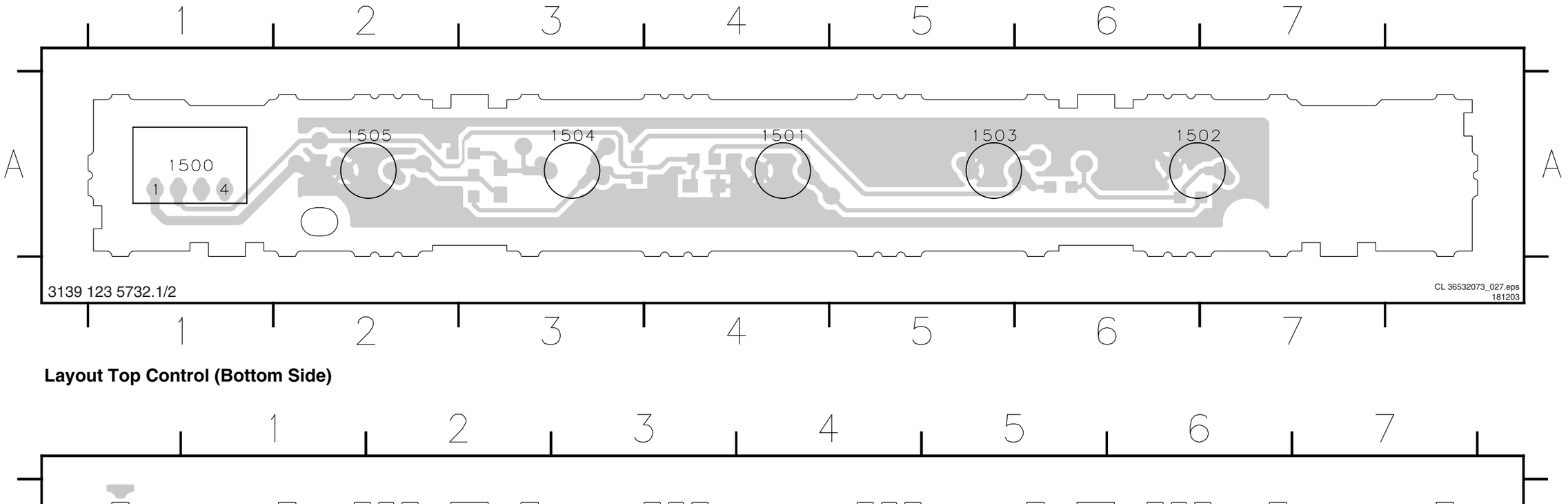
Top Control

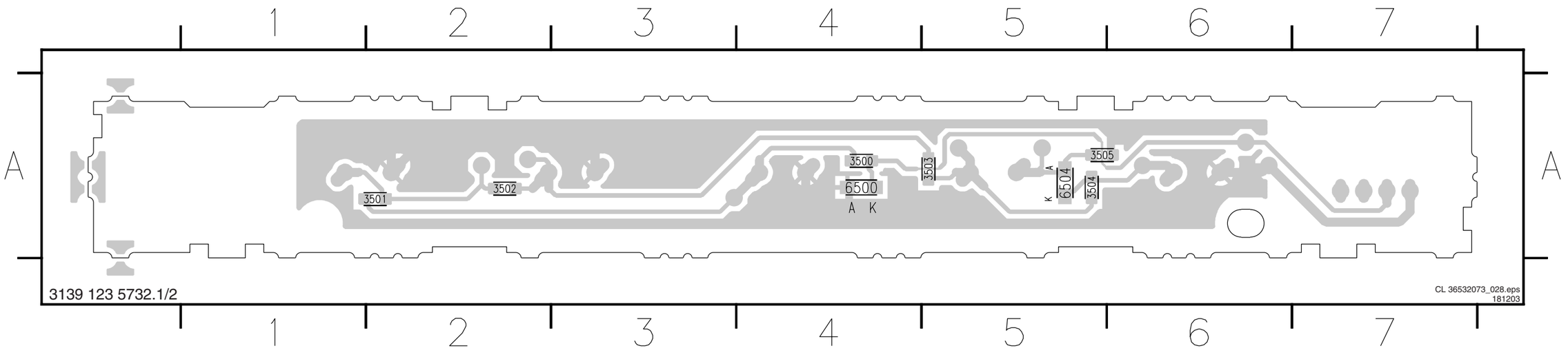


Personal Notes:

Layout Top Control (Top Side)

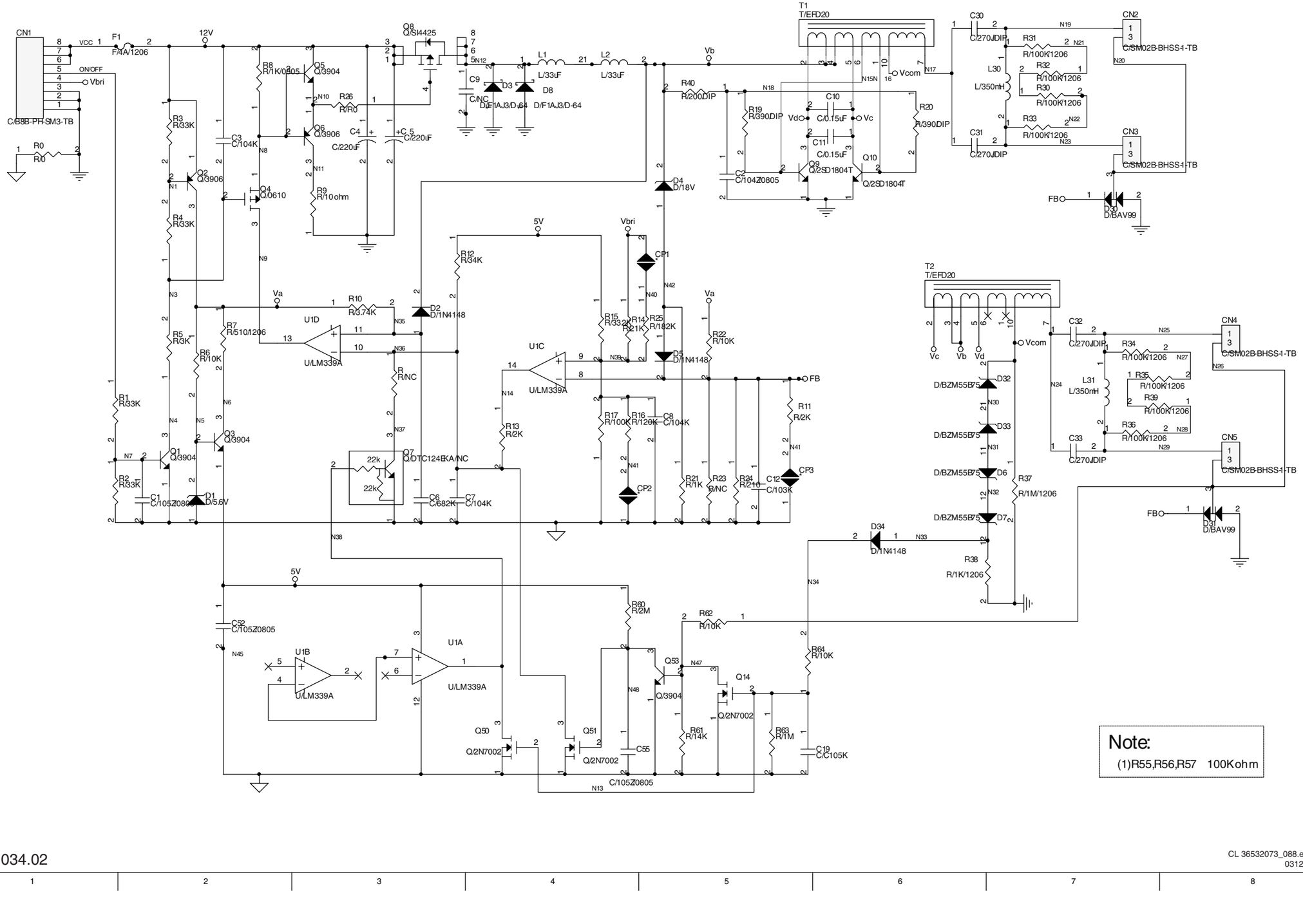


Layout Top Control (Bottom Side)



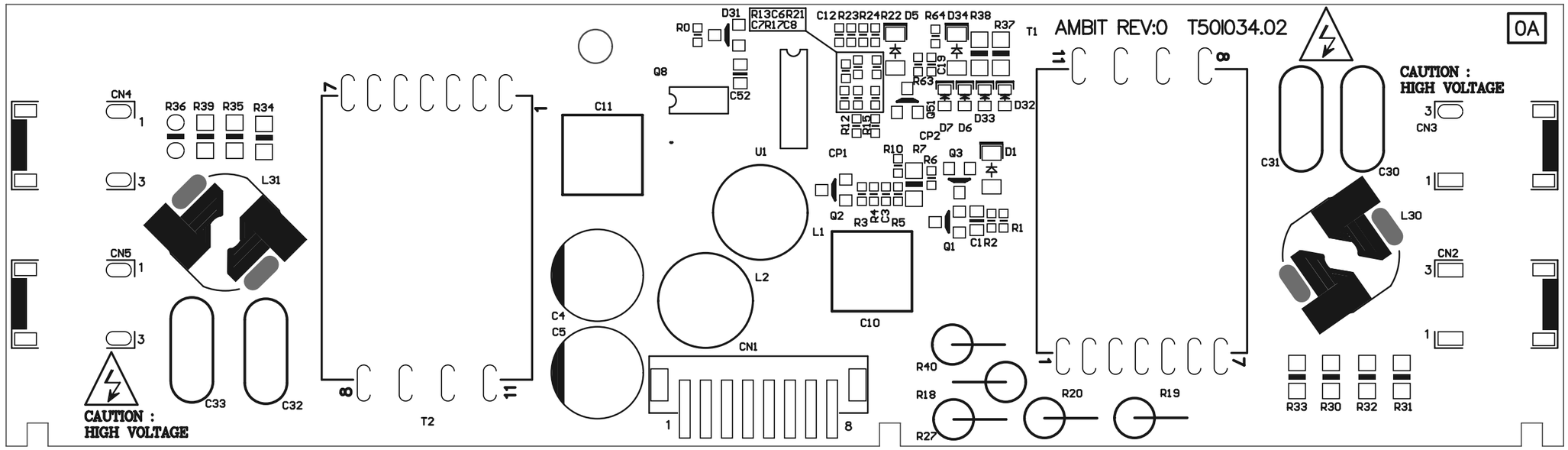
Inverter Panel (13”)

IN INVERTER PANEL (13")



Layout Inverter Panel (13")

INVERTER PANEL (13")



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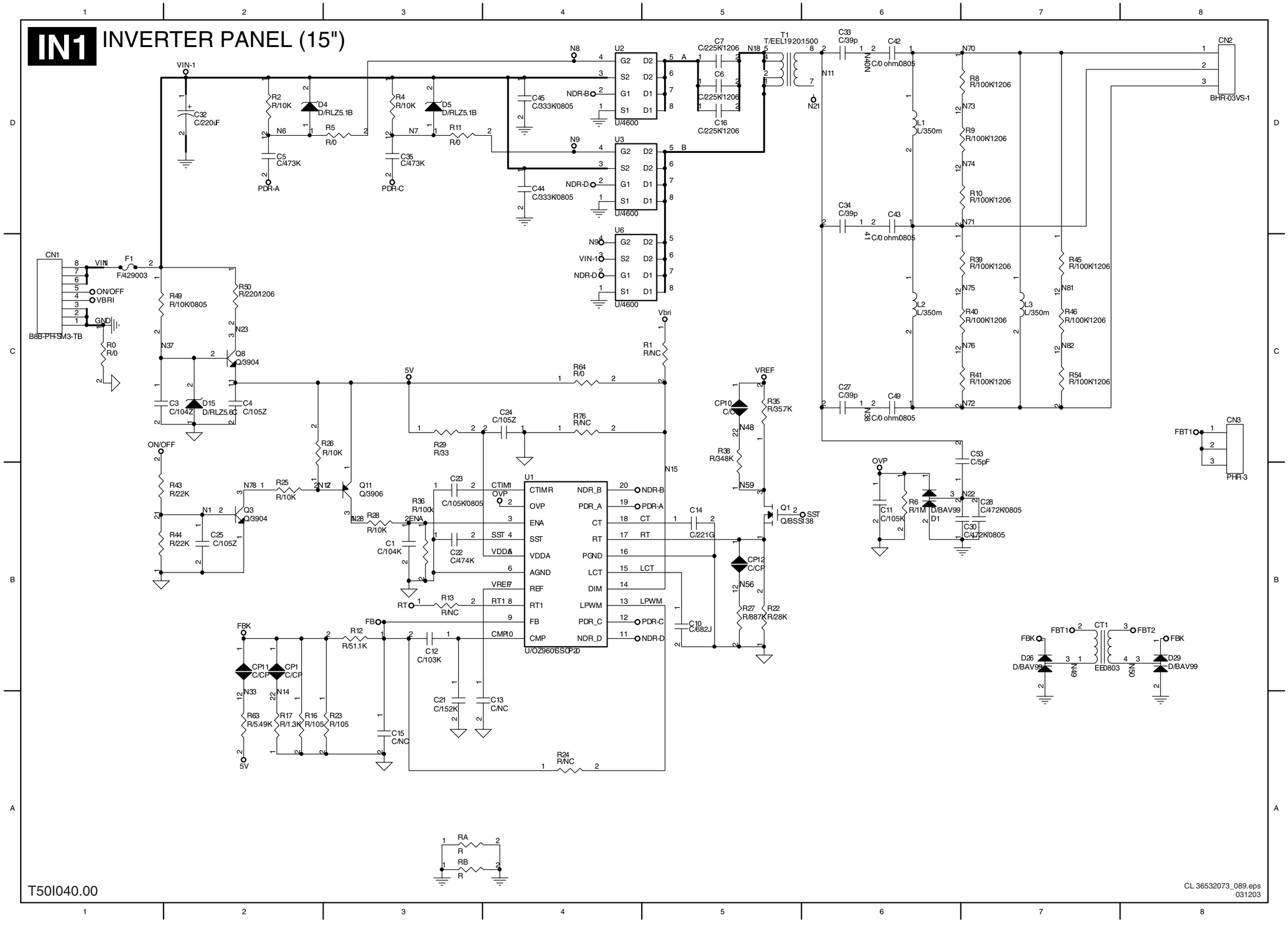
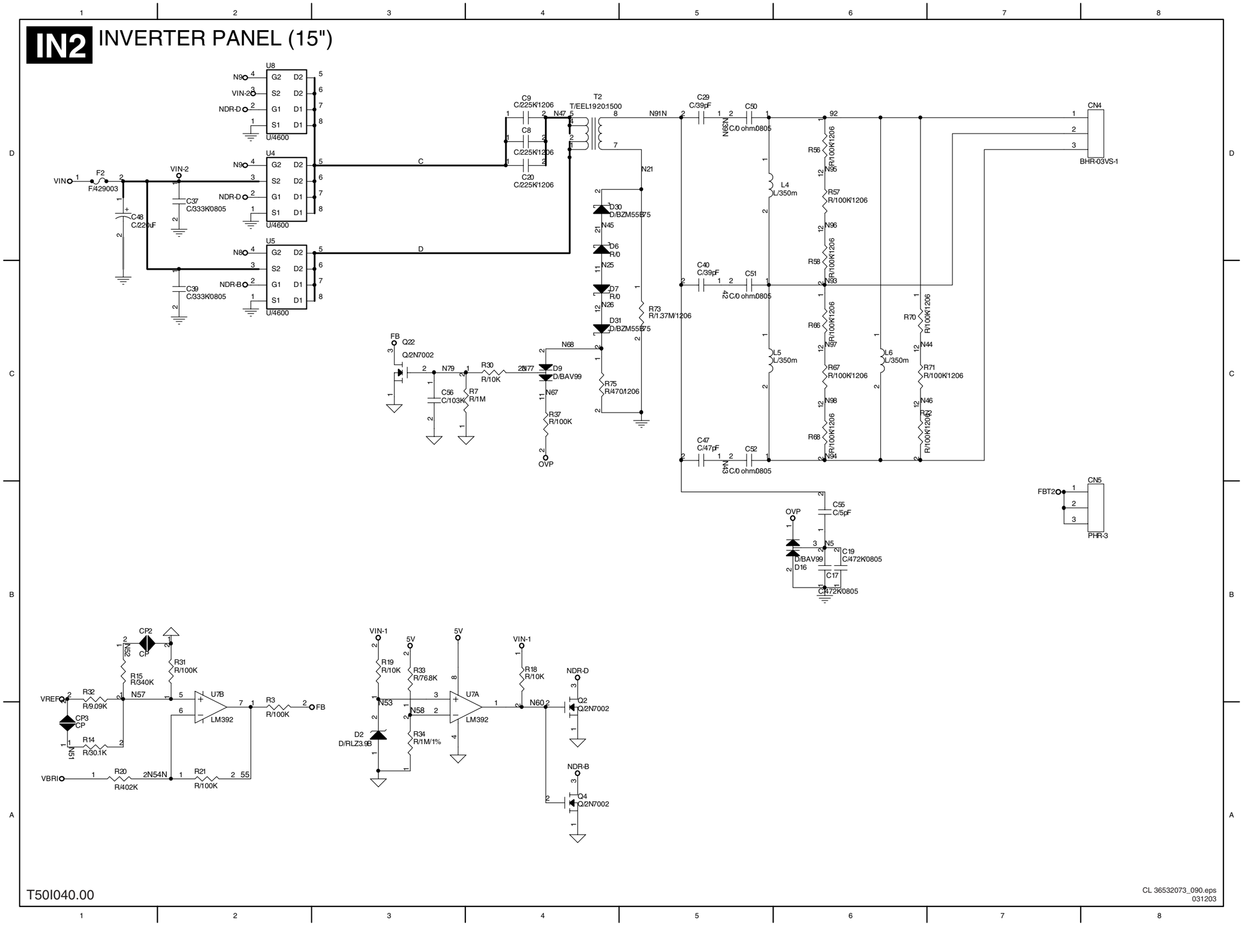
031203

Inverter Panel (15”)

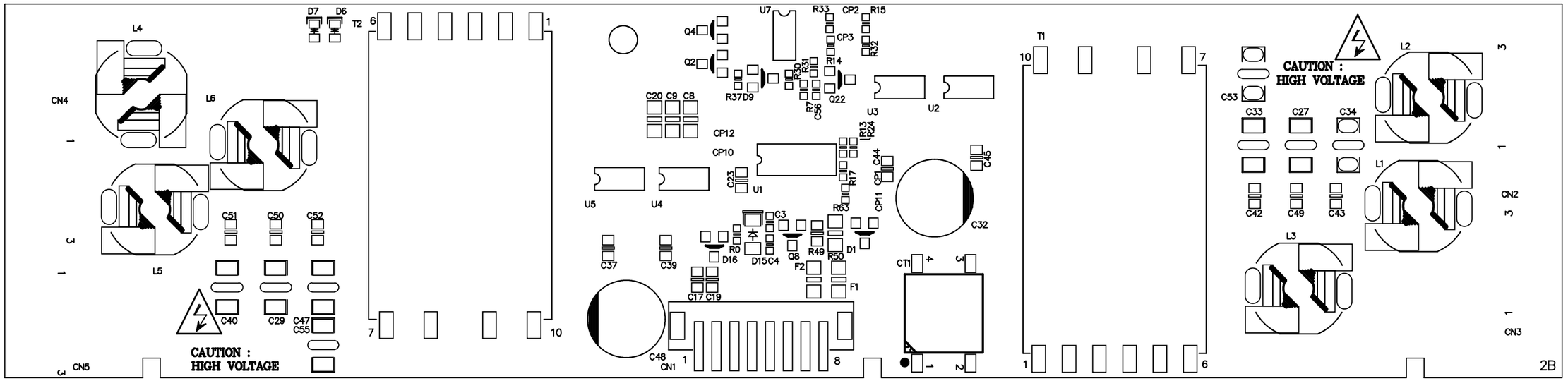


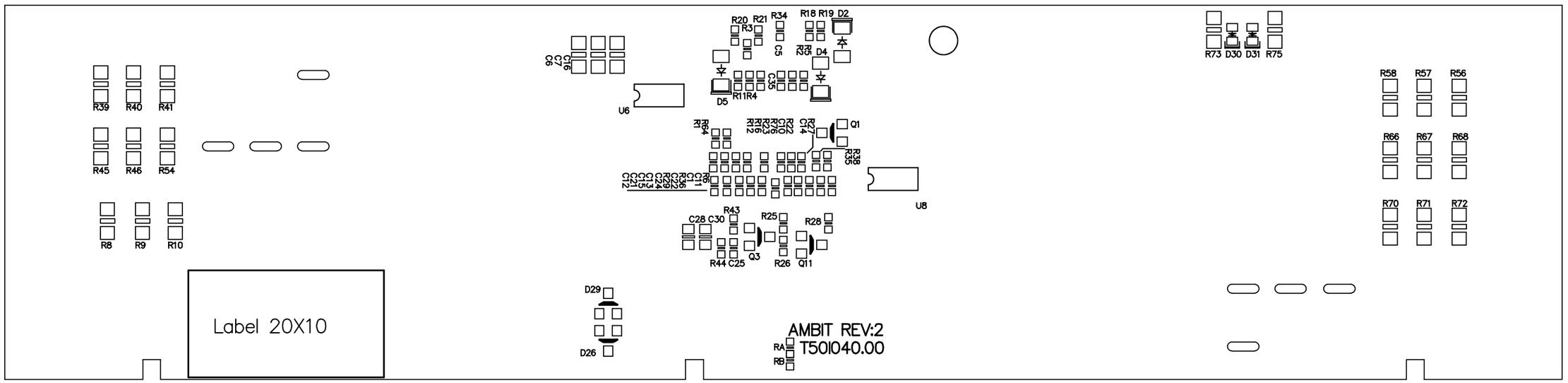
Inverter Panel (15”)



Layout Inverter Panel (15”)

INVERTER PANEL (15")





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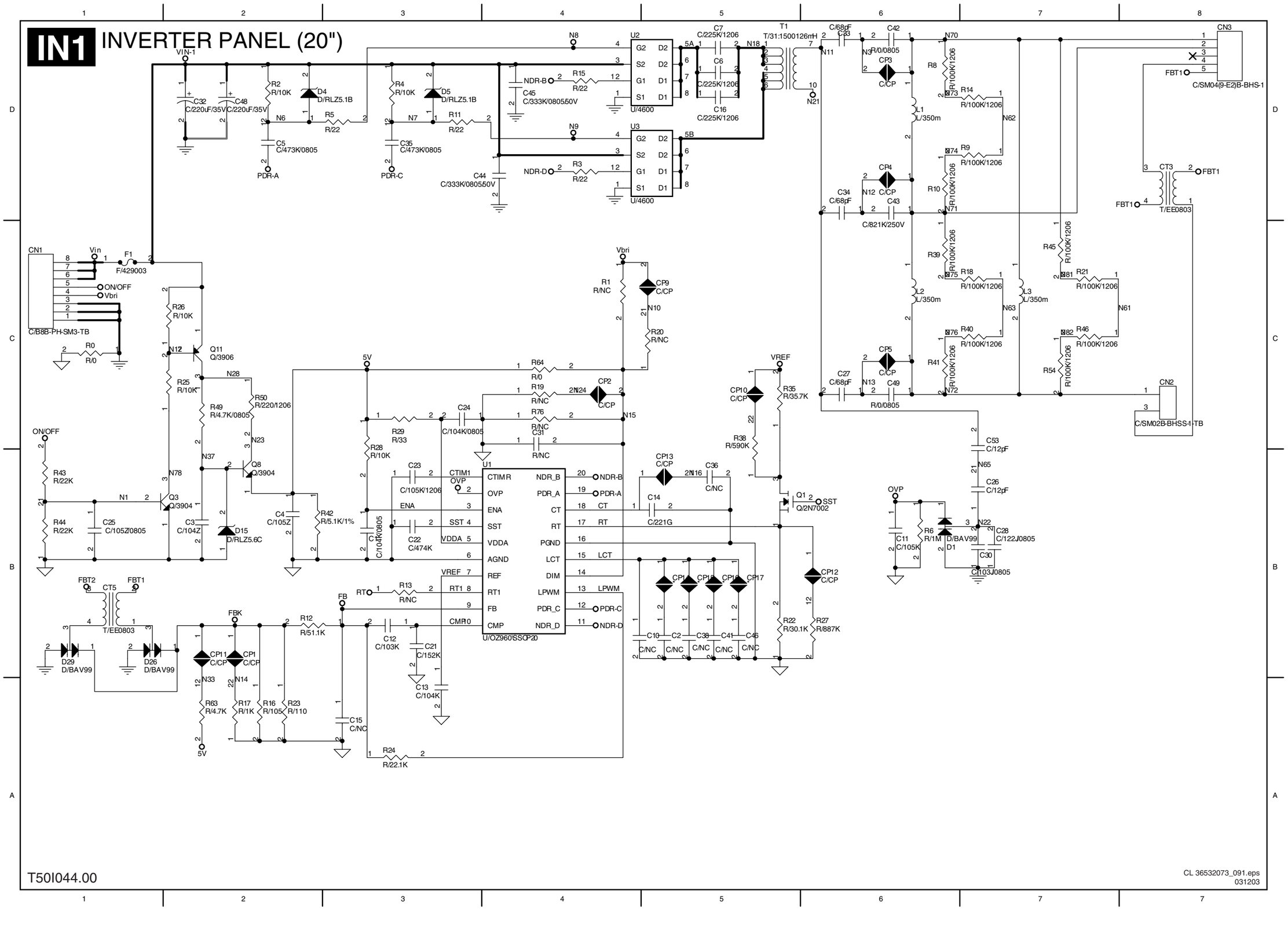
031203

Inverter Panel (20”)



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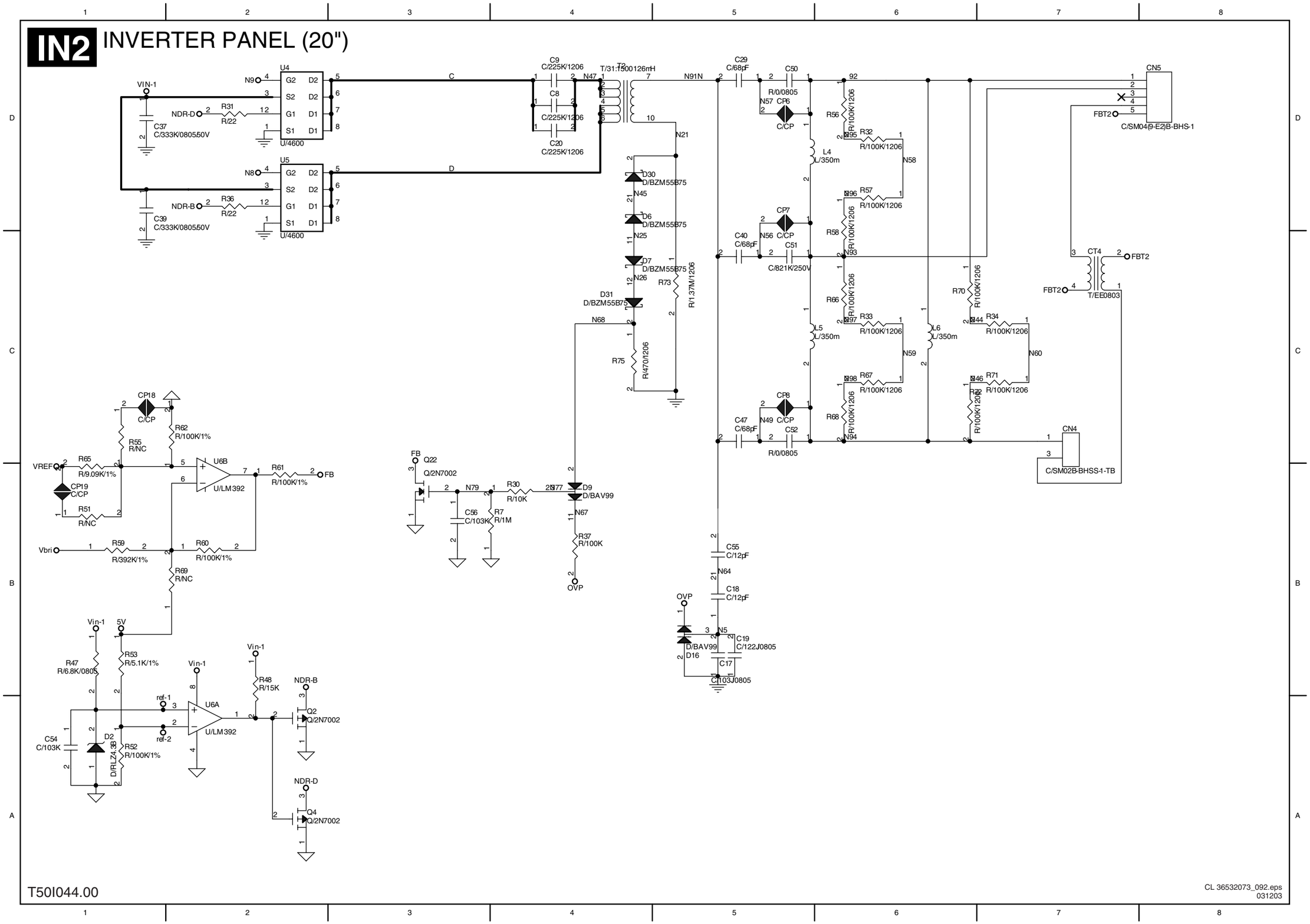
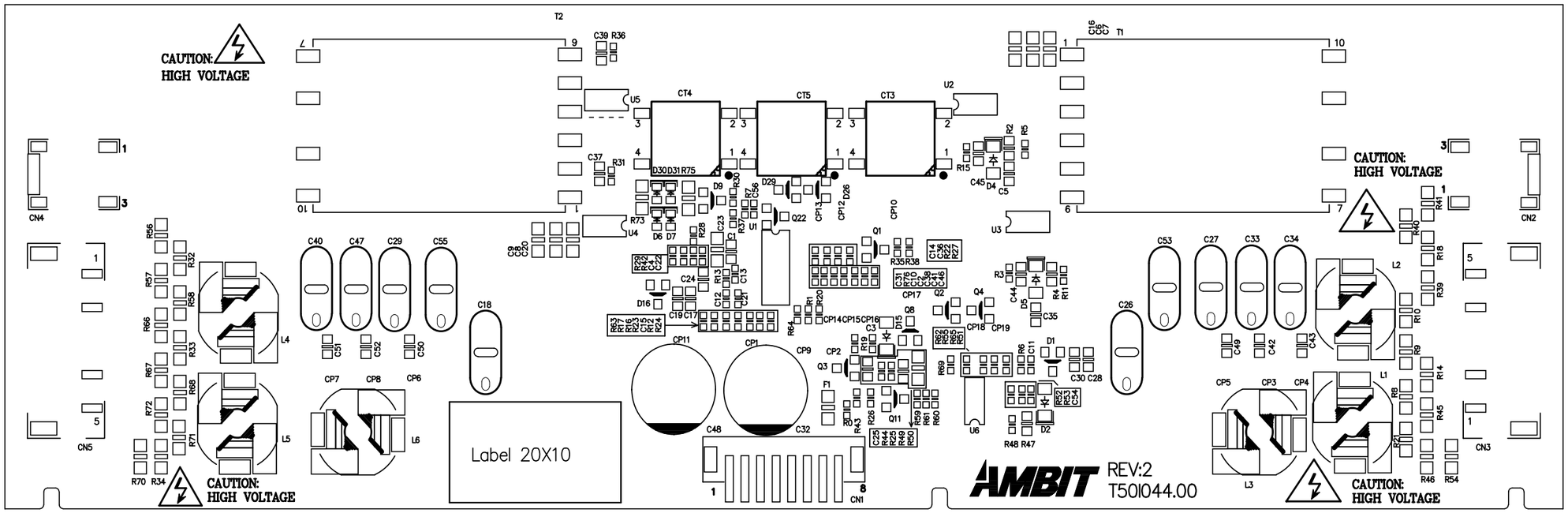
CL 36532073_091.eps
031203

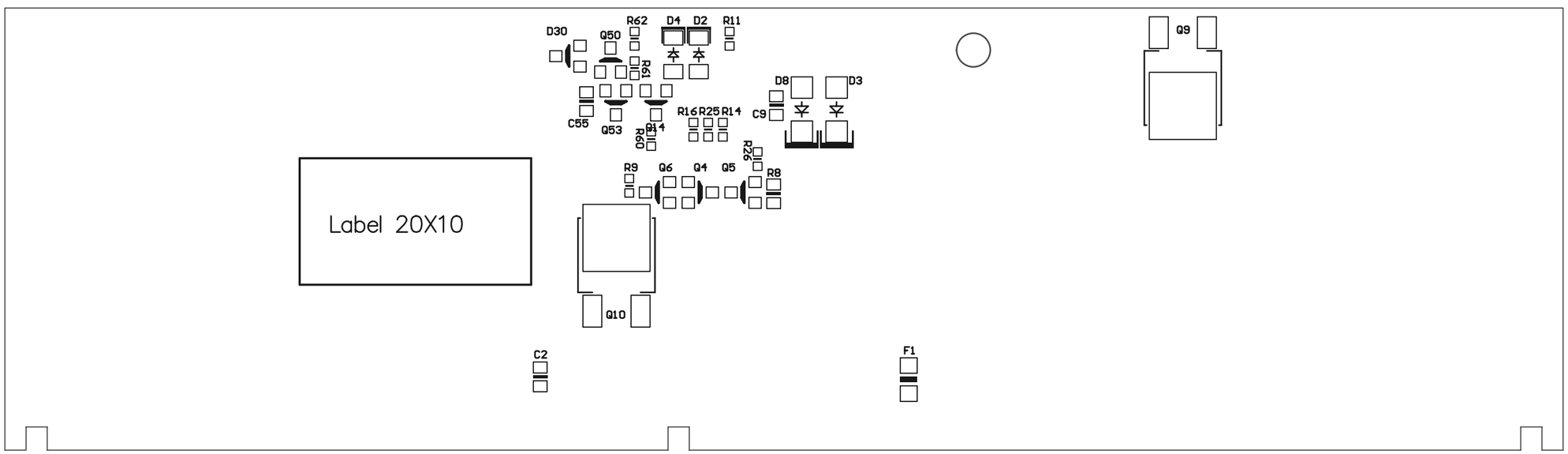
Inverter Panel (20”)



Layout Inverter Panel (20")

INVERTER PANEL (20")





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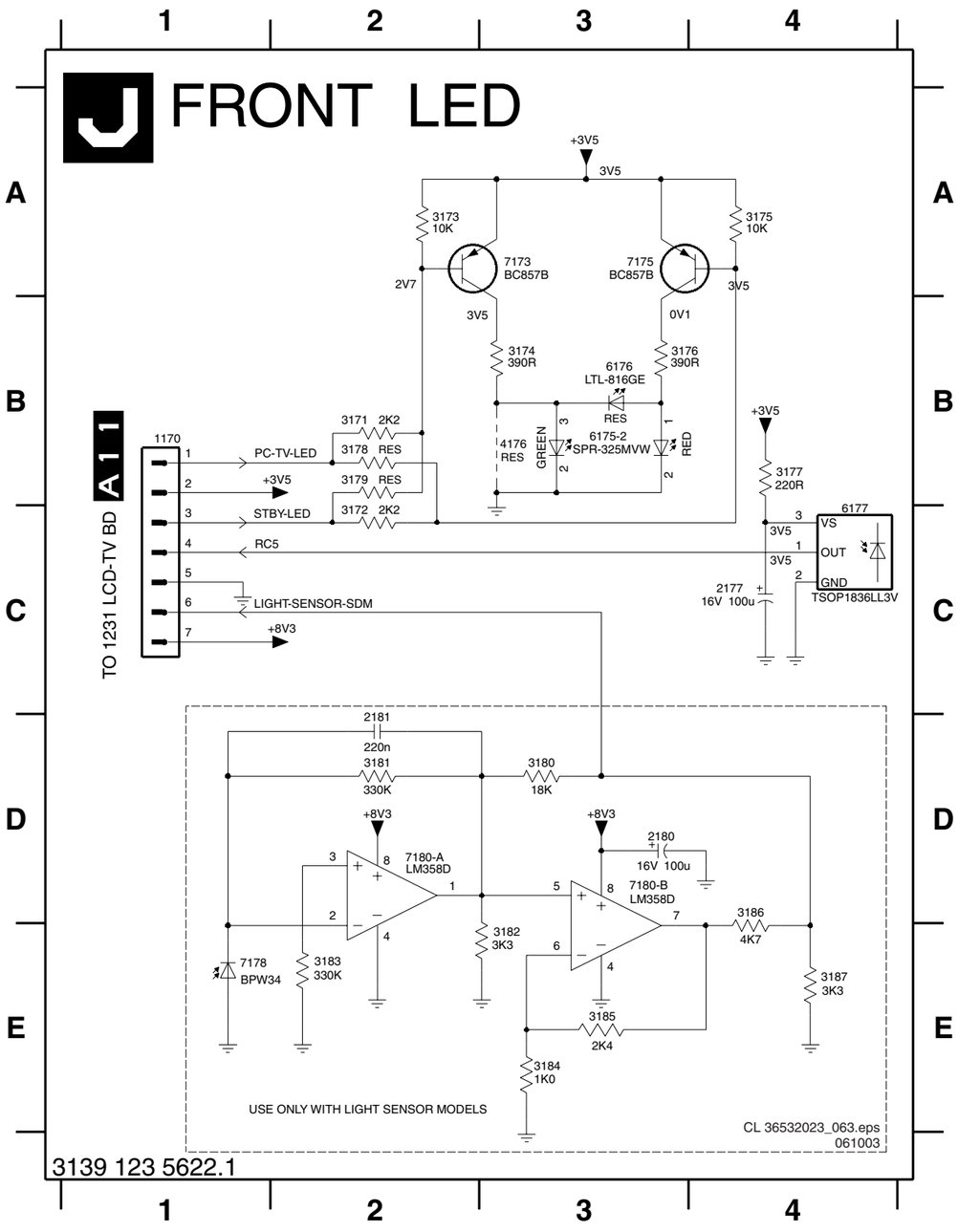
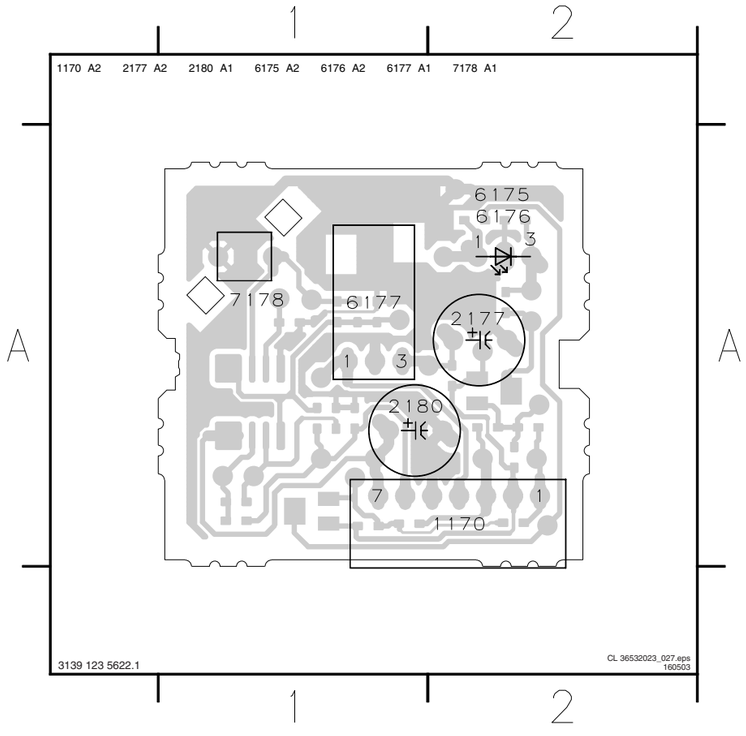
031203

Front LED Panel

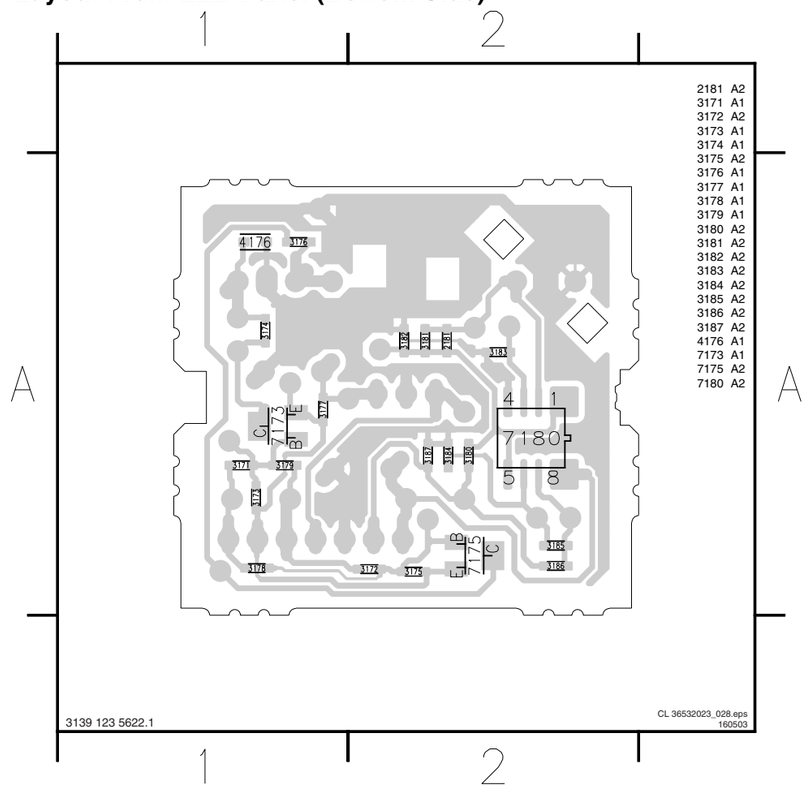


1170 B1
2177 C4
2180 D3
2181 D2
3171 B2
3172 C2
3173 A2
3174 B3
3175 A4
3176 B3
3177 B4
3178 B2
3179 B2
3180 D3
3181 D2
3182 E3
3183 E2
3184 E3
3185 E3
3186 D4
3187 E4
4176 B3
6175 B3
6176 B3
6177 C4
7173 A3
7175 A3
7178 E1
7180-A D2
7180-B D3

Layout Front LED Panel (Top Side)



Layout Front LED Panel (Bottom Side)



8. Alignments

The Service Default Mode (SDM) and Service Alignment Mode (SAM) are described in chapter 5. Menu navigation is done with the CURSOR UP, DOWN, LEFT or RIGHT keys of the remote control transmitter.

8.1 General Alignment Conditions

Perform all electrical adjustments under the following conditions:
Mains voltage and frequency: 100-240 V / 50/60 Hz.
Allow the set to warm up for approximately 10 minutes.
Test probe: Ri > 10 M ohm; Ci < 2.5 pF.

8.3.1 SAM Menu

SAM Menu

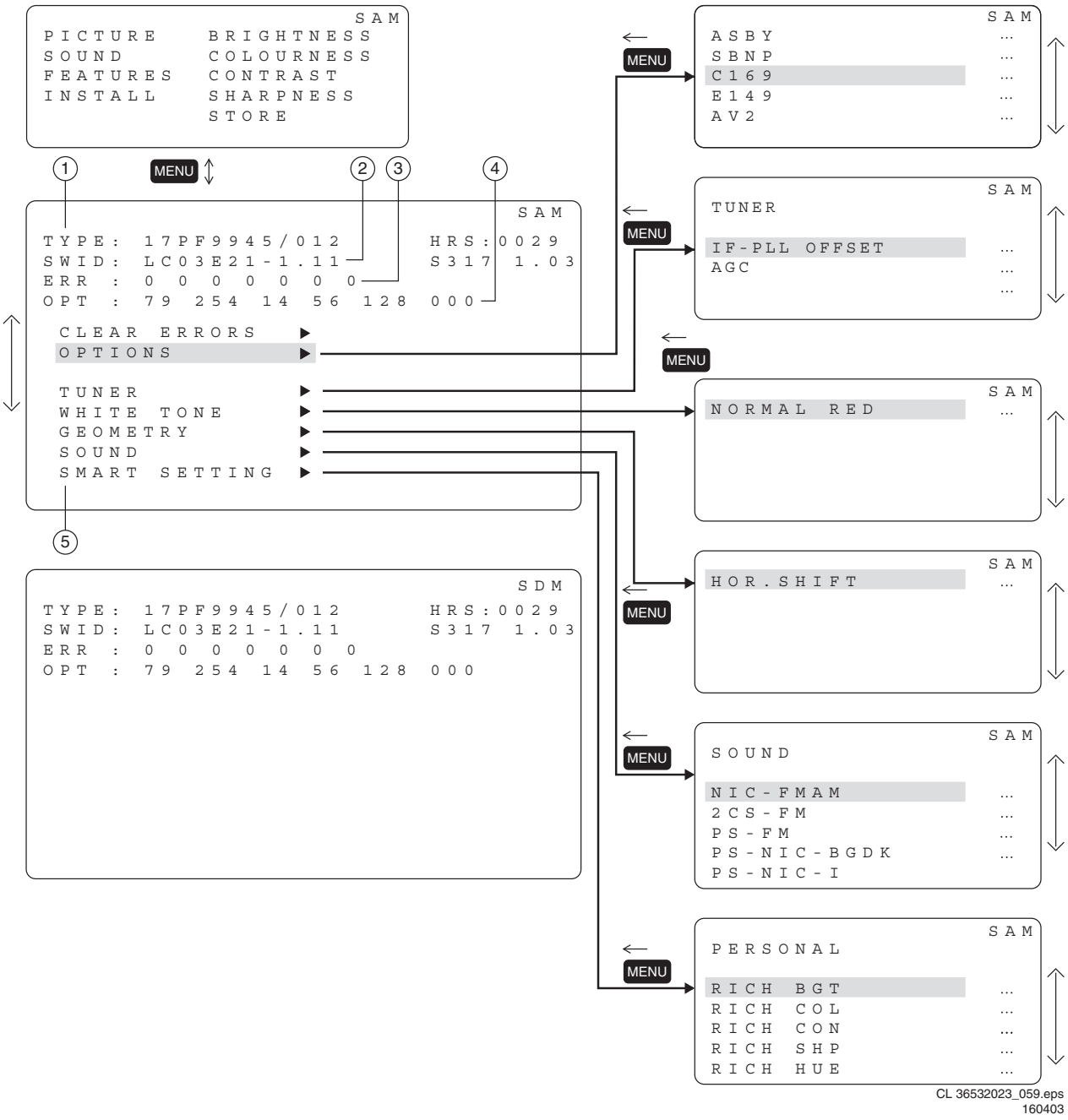


Figure 8-1 SAM menu

8.2 Hardware Alignments

There are no hardware alignments foreseen for the LCD-TV.

8.3 Software Alignments

With the software alignments of the Service Alignment Mode (SAM) the geometry, white tone and tuner (IF) can be aligned. To store the data: Use the RC button MENU to switch to the main menu and select the STORE item, by pressing the right/ left button on the RC to store the data.

8.3.2 Tuner Adjustment

AGC (RF AGC Take Over Point)
Set pattern generator (e.g. PM5418) with colour bar pattern and connect to aerial input with RF signal amplitude - 10 mV and set frequency for PAL/SECAM to 475.25 MHz. For France select the L'-signal.

- Activate the SAM-menu. Go to the sub-menu TUNER, select the sub-menu option AFC WINDOW and adjust the value to 100kHz.
- Select the AGC sub-menu.
- Connect a DC multi-meter to pin 1 of the tuner (item 1100).
- Adjust the AGC until the voltage at pin 1 of the tuner is 1.0V +/- 0.1V.
- The value can be incremented or decremented by pressing the right/left MENU-button on the RC.
- Switch the set to main menu and select the STORE item, by pressing the right/left button on the RC to store the data.

IF PLL OFFSET
No adjustments needed for these alignments.

The default values for these options are:

- IF PLL OFFSET: 31 (default).
- AGC WINDOW: 24 (default).

8.3.3 White Tone

In the WHITE TONE sub menu the color values for the colour value for RED can be changed.
In this way the colour temperature mode (NORMAL) is adjusted. Range: 0-63, 33 represent the middle of the value (no offset difference).
Note: the alignment values are non-linear. The range is: -50 to +50, 0 represents the middle value, (no offset difference).

- Input signal strength: >=10 mV rms (80 dBuV) teminal voltage.
- Input injection point: Aerial input.

Align Method
Initial Set-up

- 12 minutes soaking time before carrying out Colour Temp alignment.
- Incredible Picture/Contrast+ and Active Control (Blue stretch off) must be switched OFF for proper tracking.
- The alignment is done for NORMAL only.

Method of alignments

1. Place the colour sensor of the meter at the centre of the screen.
2. Set the meter in (T, delta UV, Y) mode.
3. Set brightness and colour to nominal (factory mode).
4. Set contrast to make the light output Y on the meter 250 nit +/-10%.
5. Adjust GREEN to bring delta UV to the value as in the table.

Expected Results
Measured parameters: Refer to table.
Specifications: Refer to table.
Units of measurement: Kelvin.

Table 8-1 Colour Temperatures

Colour temperature	13" VGA (NORMAL)		15" XGA (NORMAL)		20" VGA (NORMAL)	
	T (K)	ΔUV	T (K)	ΔUV	T (K)	ΔUV
EUROPE	8,500	-0.003	9,500	-0.003	9,000	-0.003
AP	8,500	-0.003	9,500	-0.003	9,000	-0.003
USA	8,500	-0.003	9,500	-0.003	9,000	-0.003
LATAM	8,500	-0.003	9,500	-0.003	9,000	-0.003
Tolerance	+/-10%	+/-0.003	+/-10%	+/-0.003	+/-10%	+/-0.003

8.3.4 Geometry

The geometry alignments menu contains 1 item to align correct picture geometry. The geometry alignments is :

- HOR SHIFT; align the horizontal center of the picture to the horizontal center of the display.

8.3.5 Sound

No adjustments needed for sound.

The default values for the audio alignments are:

- NIC-FMAM: 250 (NICAM error rate threshold, the higher the more tolerance).
- 2CS-FM: 40.
- PS-FM: 38 (Pre-scale for FM).
- PS-NIC BG/DK: 82 (Pre-scale for NICAM in BG/DK system).
- PS-NIC I: 127 (Pre-scale for NICAM in I system).
- PS-NIC L: 82 (Pre-scale for NICAM in L system).
- DEVIATION: on/off.

8.4 Options

8.4.1 Options

Options are used to control the presence / absence of certain features and hardware. There are two ways to change the option settings, see figure 1: "Service Alignments Mode screens and structure".

Changing a single option
An option can be selected with the MENU UP/DOWN keys and its setting can be changed with the MENU LEFT/RIGHT keys.

Changing multiple options by changing option byte values
Option bytes make it possible to set very fast all options. An option byte represents a number of different options. All options of the chassis are controlled via 8 option bytes. Select the option byte (OB1, OB2, OB3, OB4, OB5, OB6, OB7, OB8) and key in the new value.

8.4.2 List of options

Unless otherwise stated:
- Y(es) means present (or ON),
- N(o) means not present (or OFF).

Table 8-2 List of options

Features	Abbreviations LC13	Description
Auto Standby (after 2 hours)	ASBY	OFF=Disabled auto standby.
		ON=Enabled auto standby after 2 hours.
Auto Standby No Picture	SBNP	OFF=Disabled, no automatic switch to standby.
		ON=Enabled, switches to standby after 10 minutes when no ident.
Picture setting for Compress 16:9	C169	OFF=Disabled, 16:9 COMPRESS setting is not available in FORMAT menu.
		ON=Enabled 16:9 COMPRESS setting is available in FORMAT menu item.
Picture setting for Expand 14:9	E149	OFF=Disabled, 14:9 EXPAND setting is not available in FORMAT menu.
		ON=Enabled 14:9 EXPAND setting is available in FORMAT menu item.
SCART2 AV Source	AV2	OFF=Disabled, AV2 not available.
		ON=Enabled, AV2 available.
Auto Standby with timer	AUSB	OFF=Disabled.
		ON=Enabled.
Wide Screen	WSCR	OFF=Disabled, wide screen is displayed by FORMAT.
		ON=Enabled, FORMAT is replaced by WIDESCREEN.
Comb Filter	CBFL	OFF=Disabled, no comb filter on the SSB.
		ON=Enabled, comb filter on the SSB.
Incredible Picture	IPIX	OFF=Disabled, INCR, PICT is replaced by CONTRAST+
		ON=Enabled, CONTRAST+ is replaced by INCR, PICT.
Incredible Picture via Menu	IPMU	OFF=Disabled, menu item INCR. PICT not available.
		ON=Enabled, menu item INCR. PICT available.
Virtual Dolby	VDBY	OFF=Disabled, menu item DOLBY VIRTUAL not available.
		ON=Enabled, menu item DOLBY VIRTUAL available.
Philips Tuner	PITN	OFF=Disabled, ALPS compatible tuner is used.
		ON=Enabled, Philips compatible tuner is used.
Automatic Channel Installation	ACI	OFF=Disabled, Automatic Channel Installation.
		ON=Enabled Automatic Channel Installation.
Automatic Tuning System	ATS	OFF=Disabled, automatic tuning system is ignored.
		ON=Enabled Automatic tuning system, sort the program in an ascending order starting from Program 1.
Program List	PLST	OFF=Disabled, the access to program List Command is ignored.
		ON=Enabled the access to program List Command is processed.
Virgin Mode	VMOD	OFF= Virgin mode disabled.
		ON= Virgin mode enabled.
Smart OSD (Picture and sound)	SOSD	OFF=Disabled, full display of OSD not available.
		ON=Enabled, full display of OSD available.
Favorite Page	FAPG	OFF=Disabled favorite page in Teletext mode.
		ON=Enabled favorite page in Teletext mode.
UK Plug and Play	UKPNP	OFF=Disabled, cannot access 'Plug and Play'.
		ON=Enabled, can access 'Plug and Play'.
Dynamic noise reduction	DNRM	OFF= Dynamic noise reduction
		ON= Dynamic noise reduction
Video Mute	VMUT	OFF=Disabled, no video blanking during channel/source change.
		ON=Enabled, video blanking during channel/source change.
Automatic Volume Leveller	AAVL	OFF=Disable, menu item AVL not available.
		ON=to enable, menu item AVL available.
Sound Board MSP3451	SNIC	OFF=Disabled, Sound IC MSP3451 is not present.
		ON=Enabled, Sound IC MSP3451 is present.
Time Window	TMWIN	OFF=Disabled, Time Window is set to 2 secs.
		ON=Enabled, Time Window is set to 5 secs.
Max No. of Programs	NPRG	OFF=Disabled, maximum no. of program 100.
		ON=Enabled maximum no. of program 80.
Wide Screen Signal Bit	WSSB	OFF=disable the detection of off-air transmission wide screen signal bit.
		ON=to enable the detection.
Internal Comb Filter	INCF	OFF=disable the BOCMA internal comb filter (for demo purpose).
		ON=to enable.
NVM data protection	NVM	OFF=Disabled.
		ON=Enabled.
HML	HML	OFF
		ON
FM radio ON	FMON	OFF=Disable FM radio.
		ON=Enable FM radio.
Lip synchronisation	LSYN	OFF= Lip synchronisation
		ON= Lip synchronisation
Panel size	PASI	OFF for 20"
		ON for 13"
System	SYSTEM	EW - Select West. Europe's colour and sound system.
		EE - Select East. Europe's colour and sound system.
		EM - Select Central Europe's colour and sound system.
Option Byte 1	OB1	8 bits, 7-1 (used)
Option Byte 2	OB2	8 bits, 7-1 (used)
Option Byte 3	OB3	8 bits, 7-1 (used)
Option Byte 4	OB4	8 bits, 7-1 (used)
Option Byte 5	OB5	8 bits, 7-1 (not used)
Option Byte 6	OB6	8 bits, 7-1 (not used)
Option Byte 7	OB7	8 bits, 7-1 (not used)
Option Byte 8	OB8	8 bits, 7-1 (used)

8.4.3 Option bits/bytes (Default values)

Table 8-3 Option bytes default values

	13PF7835/58	15PF7835/58	20PF7835/58	13PF7835/12	15PF7835/12	20PF7835/12
OB1	124	124	125	124	124	125
OB2	223	223	223	222	222	222
OB3	95	95	95	94	94	94
OB4	52	52	52	52	52	52
OB5	0	0	0	0	0	0
OB6	0	0	0	0	0	0
OB7	0	0	0	0	0	0
OB8	1	1	1	0	0	0

Note: Set all “Not used” Option bytes to 0

9. Circuit Descriptions, Abbreviation List, and IC Data Sheets

Index of this chapter

9.1 Introduction

The LC13 LCD TV is based on the A10 Small Signal Board, with additional I/O's, Tuner, Scaler Board, and Audio Amplifier. The Scaler board is added, for scaling all input signals to the preferred LCD resolution.

9.2 Block Diagram

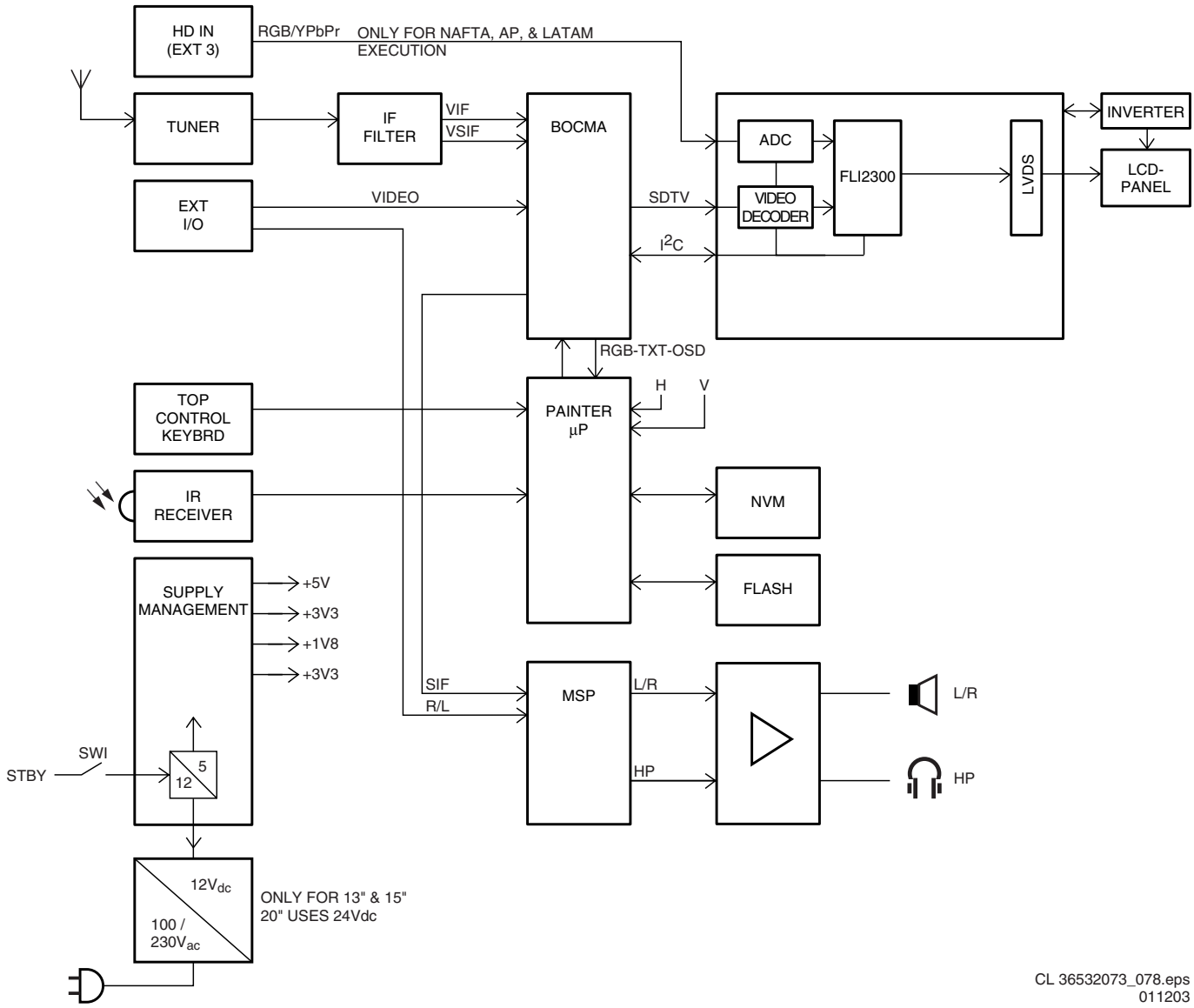


Figure 9-1 Block diagram LCD TV

The PLL tuner UR1316 (with FM radio) delivers the IF-signal, via audio & video SAW-filters, to the multi-system TV processor TDA888x (item 7301, also called BOCMA). This IC has the following functions:
- Multi-system decoder.
- Video source- and record select.
- Colour decoder.
- RGB output.
- Sound demodulator.
- Geometry control.
- Picture improvement.
- Synchronisation.

The BOCMA has one input for the internal CVBS signal and two inputs for external CVBS or Y signals. It has only one chroma input so that it is not possible to apply two separate Y/C inputs. The selection is made via the I2C-bus.
It has two independently switch able CVBS outputs for e.g. TXT, Comb-filter, CVBS-monitor, or PIP (optional).
Two SCART-connectors are used: SCART1 is fully equipped and SCART2 is meant for VCR. Pin 10 of SCART2 is used for Easylink (P50) and there is a possibility for Y/C in. The CVBS-out on pin 19 can be used for WYSIWYR (What You See Is What You Record).
Internal video processing is done with YUV-signals. It also handles the video control, geometry part, and the insertion of the TXT/OSD RGB-signals. The video part delivers the RGB signals to the Scaler panel.

The Scaler board can receive two video input signals: SDTV (from BOCMA) or HD (from external HD source like DVD). The SDTV and HD signals are first digitalised, after which they enter the Fli2300. This component does de-interlacing, scaling, and video processing.
After the video processing, the digital data is send via a Low Voltage Differential Signalling bus to the LCD panel. LVDS is used to improve data speed and to reduce EMI significantly.

The microprocessor, called Painter (SAA55XX, IC7064), takes care of the set control, error generation and analogue TXT/OSD input- and output processing.
The Painter, ROM, and RAM are supplied with 3.3 V, which is also present during STANDBY.
The NVM (Non Volatile Memory) is used to store the settings, the flash-RAM contains the set software and the DRAM (located inside the microprocessor) is capable for storing 10 Teletext pages.

The sound part is built up around the MSP34xx (Multi-channel Sound Processor) for IF sound detection, sound control and source selection. Dolby decoding is also done by the MSP. Amplification is done via an integrated power amplifier IC (AN7522 for 13” and 15” models, AN5277 for 20” models).

Power supply input is a DC voltage coming from an external power adapter.

9.3 Power Supply

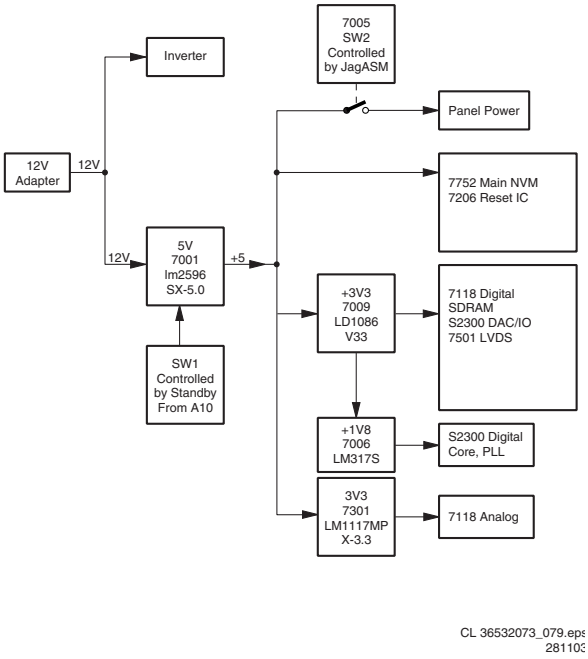


Figure 9-2 Block diagram power distribution.

9.3.1 External Power Adapter

The power source for the LC13 is an **external** AC/DC adapter (not repairable). The type and power of this adapter depends on the screen size of the LCD panel and the rated audio output power. For the 13” and 15” versions, the same 12 V_dc adapter is used. However, the 20” model uses an adapter with 24 V_dc output.

Specifications for 13” and 15” models:

Power	:	12 V / 5 A
Type number	:	SA165A-1250V-3
Supplier	:	Sino American
Ordering code	:	3139 128 76811

Specifications for 20” models:

Power	:	24 V / 5 A
Type number	:	AD3591
Supplier	:	PI Electronic
Ordering code	:	3139 128 76771

9.3.2 Internal Power Distribution

For the internal power distribution, the following regulators are used:
- Low power supply regulator LM2596T-5: working frequency 150 kHz, switch current 3 A, max. input voltage 40 V, max. output voltage 5 V.
- Low power supply regulator MC34063A: working frequency 24 - 42 kHz, switch current 1.5 A, max. input voltage 40 V.

The supply voltages for the TV board are derived via three MC34063A voltage regulators.

Standby: The STANDBY line (active “low”) comes from the microprocessor and pulls the gate of FET 7900 to ground when activated. This will block the FET. Directly after this FET, a fuse (1903) is located.

Power down: When the DC voltage from the external adapter drops below a certain value, the POWER_DOWN line will inform this to the microprocessor (active "low").

9.4 Input/Output

The I/O is divided over two parts: Rear I/O and Side I/O. The rear has two SCART inputs, and a HD (YPbPr) input. The side has a CVBS and Y/C (SVHS) input.

EXT1: The input of SCART1 is CVBS + RGB + L/R and the output is the video (+ sound) signal from the tuner (CVBS_TER_OUT).

EXT2: The input of SCART2 is Y/C + CVBS + L/R. The output signal is CVBS_SC2_MON_OUT (+ sound).
SCART2 is meant for VCR and has therefore some additional signals in relation to EXT1 but no RGB: it has the possibility for Y/C_in and Easylink-Plus (P50): Y_in on pin 20 and Chroma_in on pin 15.
Easylink is handled via pin 10 of the SCART2 (this is a bi-directional communication with the microprocessor) and supports the next features:

- Signal quality and aspect ratio matching
- One touch play & text
- PIP
- Pre-set download
- WYSIWYR
- Automatic Standby
- Country and language installation
- System Standby
- Intelligent set top box features
- NexTView download
- Timer record control
- VCR control feature

The selection of the external I/O's is controlled by the Painter microprocessor (pins 16 & 55) and handled via IC7401:

- SEL-MAIN-R1R2 is the selection between SCART1 (R1) and SCART2 (R2).
- SEL-FRNT-RR selection is made between Side and Rear I/O.

The status signals (on SCART pin 8) and Front detection are fed to the Painter (pins 2, 4 and 6).

HD (YPbPr) in: This input is directly going to the Scaler board. See paragraph “Video: Scaler Board”.

9.5 Tuner and IF

9.5.1 Tuner (diagram A3, A4, and A5)

A Philips UR13xx Tuner with second input (for FM Radio) is used in the TV board. The SIF FM signal is decoded by the Micronas IC.
The tuner is I2C controlled, and is capable of receiving off-air, S- (cable) and Hyperband channels.
Tuning is done via I2C. The reference voltage on pin 9 is 7.1 V. This voltage is derived from the +5 V via a DC/DC converter.

Video IF amplifier
The IF-filter is integrated in a SAW (Surface Acoustic Wave) filter. One for filtering IF-video (1452, or 1453 in case of system L/L') and one for IF-audio (1454). The type of these filters is depending of the standard(s) that has to be received.

The output of the tuner is controlled via an IF-amplifier with AGC-control. This is a voltage feedback from pin 7 of the BOCMA to pin 1 of the tuner. The AGC-detector operates on top sync and top white level. AGC take-over point is adjusted via the service alignment mode ’Tuner' - 'AGC’. If there is too much noise in the picture, then it could be that the AGC setting is wrong. The AGC-setting could also be mis-aligned if the picture deforms with perfect signal; the IF-amplifier amplifies too much.

An (alignment free) PLL carrier regenerator with an internal VCO demodulates the video signal. This VCO is calibrated by means of a digital control circuit, which uses the clock frequency of the microprocessor as a reference. The frequency setting for the various standards is realised via the I2C-bus. The AFC output is generated by the digital control circuit of the IF-PLL demodulator and can be read via the I2C-bus.

The video identification circuit is used to identify the selected CBVS or Y/C signal. The IC contains a "group delay correction" circuit, which can be switched between the BG and a flat group delay response characteristic. This has the advantage that in multi-standard receivers no compromise has to be made for the choice of the SAW filter. Also, the sound trap is integrated. The centre frequency of the trap can be switched via the I2C-bus. The signal is available on pin 27.

QSS sound circuit
The single reference QSS mixer is realised by a multiplier. In this multiplier, the SIF signal is converted to the intercarrier frequency by mixing it with the regenerated picture carrier from the VCO. The mixer output signal is supplied to the output via a high-pass filter for attenuation of the residual video signals. With this system, a high performance hi-fi stereo sound processing can be achieved.

The AM sound demodulator is realised by a multiplier. The modulated sound IF signal is multiplied in phase with the limited SIF signal. The demodulator output signal is supplied to the output via a low-pass filter for attenuation of the carrier harmonics. The AM signal is supplied to the output (pin 27) via the volume control.

9.6 Video: TV-board (diagrams A4 and A5)

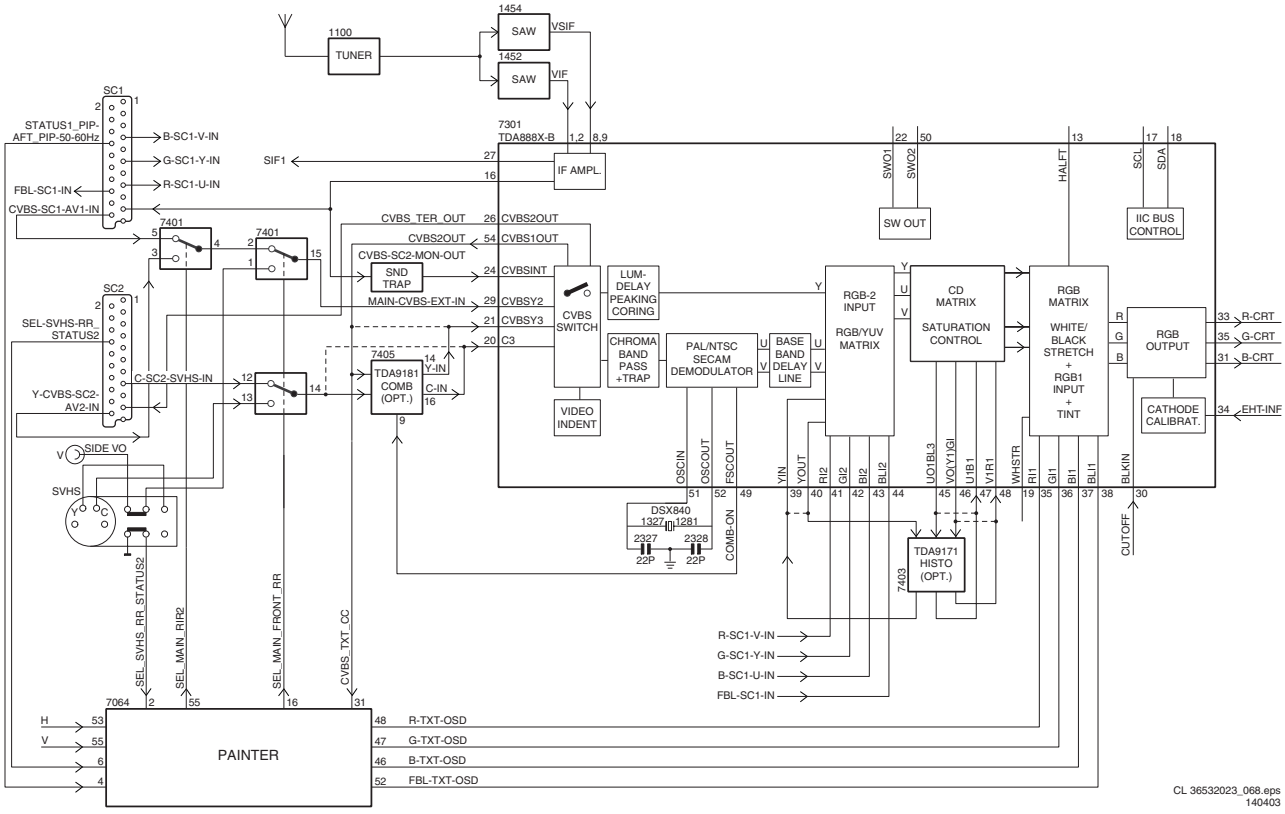


Figure 9-3 Block diagram video processing

The video processing is completely handled by a one-chip video processor: the TDA888x. This IC is called BOCMA (Bimos One Chip Mid-end Architecture) and contains:
- IF demodulator.
- Chrominance decoder
- Sync separator.
- Horizontal & vertical drive.
- RGB processing.
- CVBS and SVHS source select.

It has also build in features like:
- CTI.
- Black stretch.
- Blue stretch.
- White stretch.
- Slow start up.
- Dynamic skin tone correction etc.

Further, it also incorporates sound IF traps and filters, and requires only one crystal for all systems.

9.6.1 Source selection

The BOCMA has an input for the internal CVBS signal and two inputs for external CVBS or Y signals. The circuit has only one chroma input so that it is not possible to apply two separate Y/C inputs.
The selection of the various sources is made via the I2C-bus. The used IC version has two independently switch able outputs:
- The CVBS1 output (pin 54) is identical to the selected signal that is supplied to the internal video processing circuit and is used as source signal for the teletext decoder (Painter). Both CVBS outputs have an amplitude of 2.0 V_pp.
- The CVBS2 output (pin 26) is fed to pin 19 of SCART2 for WYSIWYR (What You See Is What You Record).

If the Y3/C3 signal is selected for one of the outputs, the luminance and chrominance signals are added so that a CVBS signal is obtained again.

9.6.2 Analogue Comb filter

After the selection of the external signals (EXT1, EXT2 or Side I/O) is made, the Y/CVBS signal is fed to the TDA888x (pin 29) along with the Front-end signal (pin 24). The selection between the two is made in the BOCMA and the output (pin 26) is fed to the (optional) 2-line comb filter (to separate the luminance from the chroma). The comb filter output is again fed to the BOCMA (pin 21) for further processing.
The external colour signals are also fed to the comb filter. In SVHS mode the comb filter is bypassed and the external signals are directly fed to the BOCMA.
Switching the comb filter is done via pen 49 of IC7301. The "video standard" selection is done via the SYS1 and SYS2 signals from the microprocessor. If the comb filter is not used, jumpers are present and the external Y/C signals are directly fed to the pins 20, 21 of IC7301.
After this stage, the external RGB signals (from SCART) are added to pins 40 - 44.

9.6.3 Histogram (YUV picture improvement) IC

The demodulated video-signal can be checked on pins 40, 45, and 46 of IC7301 and is fed to pins 39, 47, and 48. In this path, the Histogram IC TDA9171 can be inserted. Without this IC, jumpers are used.
The TDA9171 can control picture improvements like: histogram processing and blue stretch.

9.6.4 Chroma and Luminance processing

The BOCMA (IC7301-B) contains a chroma band pass and trap circuit (including a luminance delay line and the delay for

the peaking circuit). The centre frequency of the chroma band pass filter is switch able via the I2C-bus so that the performance can be optimised for 'front-end' signals and external CVBS signals.

9.6.5 Colour decoder

The colour decoder (demodulator) can decode PAL, NTSC, and SECAM signals. The internal clock signals for the various colour standards are generated by means of an internal VCO, which uses the 12 MHz crystal (item 1330) frequency as a reference.
Under bad-signal conditions (e.g. VCR-playback), it may occur that the colour killer is activated although the colour PLL is still in lock. When this killing action is not wanted it is possible to overrule it.
The IC contains an Automatic Colour Limiting (ACL) circuit, which is switch able via the I2C-bus, and which prevents that over saturation occurs when signals with a high chroma-to-burst ratio are received.
The reference frequency of the colour decoder is fed to the FSC output (pin 49) and can be used to control an external comb filter (only for 20 inch models).
The base-band delay line is integrated. The demodulated colour difference signals are internally supplied to the delay line. The colour difference matrix switches automatically between PAL/SECAM and NTSC.

9.6.6 Picture improvement features

In the BOCMA, various picture improvement features have been integrated. These features are:
- Video dependent coring in the peaking circuit. The coring can be activated only in the low-light parts of the screen. This effectively reduces noise while having maximum peaking in the bright parts of the picture.
- Colour Transient Improvement (CTI). This circuit improves the rise and fall times of the colour difference signals.
- Black-stretch. This circuit corrects the black level for incoming video signals, which have a deviation between the black level and the blanking, level (back porch).
- Blue-stretch. This circuit is intended to shift colour near 'white' with sufficient contrast values towards more blue to obtain a brighter impression of the picture
- White-stretch. This function adapts the transfer characteristic of the luminance amplifier in a non-linear way dependent on the picture content. The system operates such that maximum stretching is obtained when signals with a low video level are received. For bright pictures, the stretching is not active.
- Dynamic skin tone (flesh) control. This function is realised in the YUV domain by detecting the colours near to the skin tone. The correction angle can be controlled via the I2C-bus.

9.6.7 RGB output

The ICs have a flexible control circuit for RGB and YUV input signals which has the following features:
- Input, which can be used for YUV or RGB, input signals and as YUV interface. The selection of the various modes can be realised via the I2C-bus. For the YUV input 2 different input signal conditions can be chosen It is also possible to connect the synchronisation circuit to the incoming Y input signal. This input signal can be controlled on saturation, contrast, and brightness.
- The RGB-1 input which is intended for OSD/text signals and which can be controlled on contrast and brightness. By means of software, the insertion blanking can be switched "on" or "off". It is also possible to convert the incoming RGB-1 signal to a YUV signal. The resulting signal is supplied to the YUV outputs.
- The TDA888x versions have an additional YUV or RGB input which can be controlled on contrast, saturation, and brightness. This signal is supplied to the control circuit via the YUV interface so that an external picture improvement IC will also have effect on this signal.

9.6.8 Synchronisation (diagrams A4 and A5)

Horizontal Sync (H Sync)
Before the video processor IC7301 can generate horizontal drive pulses (LINEDRIVE, pin 56), the supply voltages on both pins 23 and 53 must be present. After the start-up command of the Painter (via the I2C), the BOCMA starts giving horizontal pulses.

Vertical Sync (V Sync)
The vertical saw tooth generator drives the vertical output drive circuit. On pins 63 and 64 are two differential voltages DR+ and DR-. For this chassis, only DR- is used. This line is called V-SYNC, and goes to the Painter microprocessor.

Composite Sync (C Sync)
On pin 57 of IC7301 the sandcastle pulse (SC) is available. This is a 2-state pulse that is used for synchronisation of the (optional) histogram IC (item 7403).
Together with the LINEDRIVE pulse, this signal is also used to create the C-SYNC signal, which is used to synchronise the Scaler board.

9.7 Video: Scaler Board

The Scaler Board controls the display processing in an LCD TV, e.g. like the deflection circuit in a CRT-based TV. It controls all the view modes (e.g. like "zooming" and "shifting"). Features like HD inputs, are also handled by this board.

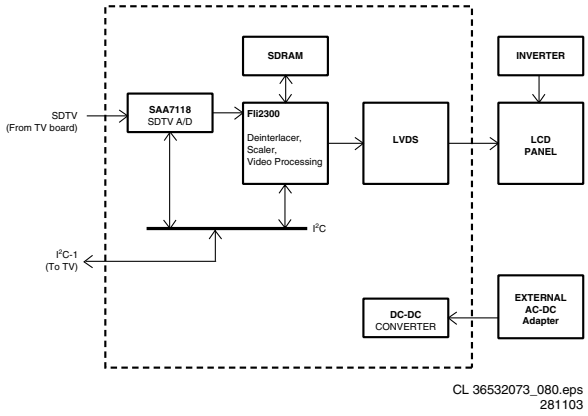


Figure 9-4 Block diagram Scaler board

9.7.1 Inputs

HD (YPbPr) input specifications
Input via Scaler Board. Supports:
- 576p, 720p and 1080i for PAL
- 480p, 720p, and 1080i for NTSC.
- Sync Detection: SOG/SOY and YUV/RGB supported.

9.7.2 Video Converter: Fli2300

This 208-pins BGA-IC creates a picture signal with double the scan lines of a conventional interlaced picture, to create a noticeably sharper and smoother image. It offers higher picture resolution and eliminates virtually all motion artefacts. Even on large screens, the progressive scan lines are barely noticeable and it reduces picture flickering significant.

Below listed processing is done in the Fli2300:

- HD/SDTV brightness, saturation, hue, and sharpness control.
- Noise reduction and de-interlacing (only for SDTV).
- Scaling
- DAC RGB output for fault finding (on connector 1352)

9.8 Audio Processing

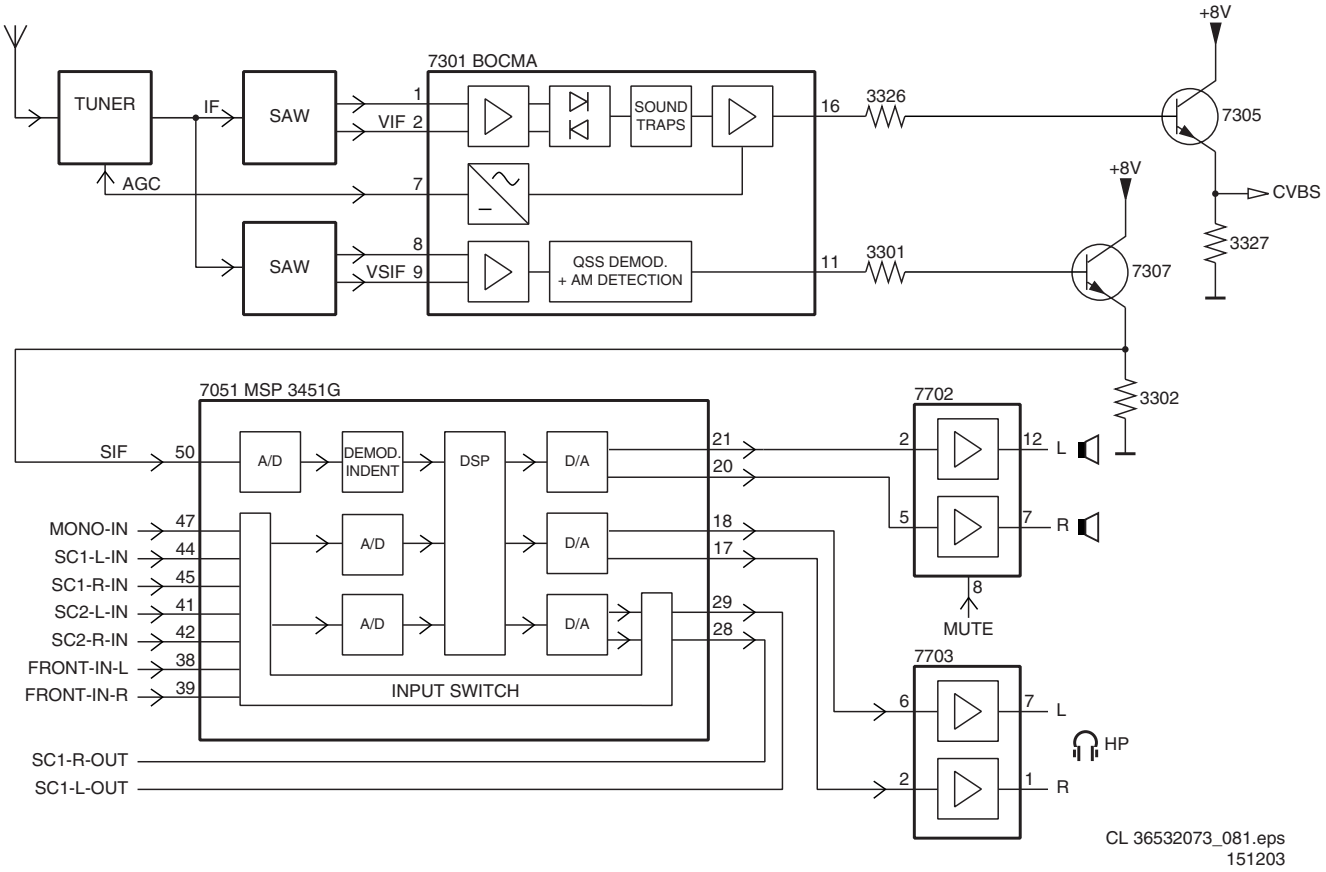


Figure 9-5 Block diagram audio processing

9.8.1 Introduction

All sets contain one of ITT's Multistandard Sound Processing ICs for sound decoding:

- MSP3410 (or 3411): Multi System (incl. NICAM) decoding for Europe and AP (Virtual Dolby).
- MSP3421 (or 3421): BTSC decoding for NAFTA and LATAM (Virtual Dolby).

This IC takes care of the main FM, AM and NICAM sound decoding.
The analogue input and output sections of MSP offer wide range of switching facilities such that it is possible to distribute all possible source signals (internal and external) to the desired output channels (main, headphone or SCART outputs).
All MSP versions contain digital audio processing, used for the basic left/right stereo sound, such as bass, treble, balance, incredible sound and spatial and source selection (SIF-signal, EXT1 or EXT2).
In addition to that, the MSP34x1 versions are also able to perform Virtual Dolby, a Dolby approved sound mode for surround sound reproduction with left/right speakers only.

9.8.2 Source selection

Table 9-1 MSP Overview

Micronas IC	System	Virtual Dolby	Region
MSP3410G	Multi-system	No	Europe/AP
MSP3411G	Multi-system	Yes	Europe/AP
MSP3420G	BTSC	No	Nafta/Latam
MSP3421G	BTSC	Yes	Nafta/Latam

The above-mentioned Micronas ICs are all having four pairs (L/R) of SCART audio inputs. The fourth input pair (AV4) is used as audio-in (input cinches located at the Scaler board) for PC and HD modes.

To get a constant level output if the Tuner is selected, the SCART1 output (Tuner at any time) has to be fed back to the input selector and selected as input for the MSP (SCART1 input).

9.8.3 Audio decoding

At the input, a choice can be made between two IF-signals; SIF and SIFM.
The selected signal is fed to the AGC. After this, an ADC converts the IF-signal to digital.
This digital signal can be processed by two demodulation channels. The first one is able to handle FM and NICAM signals. The second one can handle FM and AM signals.
Each channel contains a mixer to shift the incoming signal in the frequency domain. This shift is determined by the value of a DCO (Digital Controlled Oscillator).
After the down-mix, the signal is fed, via a filter, to a discriminator. From here the AM, FM or NICAM demodulation can be performed.
Both channels contain an 'automatic carrier mute' function, which automatically mutes the output of the analogue section when no carrier is detected.
After demodulation, the FM-signals are subjected to a de-emphasis operation. After that, the matrix of the stereo system is applied.

9.8.4 Audio processing

The sound processing is completely done by the MSP34xx:
- **Volume control** is done by the user via the SOUND menu.
- **Tone control** in 'Stereo' sets is done via the BASS/ TREBLE control.
- **Headphone control** in 'Stereo'-sets is done via the loudspeaker output of the MSP, no sound control possible. In 'Virtual Dolby'-sets, the MSP has a separate Headphone output so separate sound control is possible.
- **Mute contro**l can be done in different ways:
  - System muting. System muting is implemented for “special events” such as channel/source change event, loss of identification signal, on/off of set, during search and auto store/program, sound mode change. This muting is transparent to the user. Audio output should be muted before the above “special events” occurred, to prevent problems such as audible plop. Muting is done via the SOUND-ENABLE line (active "low") connected to the amplifier-IC and coming from the Painter.
  - Headphone status mute. A headphone status is available to detect the presence of the headphone and mute the main speakers if the headphone is detected. The microprocessor will read the HP-SIDE-DETECT status.
  - User muting. This is a mute option available to the user. The user select the MUTE option on the remote control to switched off/on the sound output to the main loudspeaker and the subwoofer.

Automatic Volume Levelling (AVL)
One of the features of the MSP-family is AVL. If used, it limits the big volume differences in the broadcast between e.g. news transmissions and commercials or within a movie.
To be able to get a Dolby approval (for the Virtual Dolby sets), the AVL feature must be switch able. Therefore, the AVL feature is customer switch able via the menu.

9.8.5 Audio amplification (diagram A9)

Some specifications:
- 13” and 15” models: 2 x 3 W with power amplifier AN7522N.
- 20” models: 2 x 5 W with power amplifier AN5277N.
- All models are equipped with a subwoofer output.

The audio output stage is built around IC7731, which is a balanced amplifier, and is located on the TV board. It uses an monolithic integrated power amplifier IC, the AN5277. The gain of the amplifier is constant. This means that volume control has to be done via the MSP. The supply voltage (12 or 24 V depending on the screen size) is filtered by L5733.
The AN5277 (for 20 inch models) delivers an output of 2 x 10 W_RMS to two full range speakers. A subwoofer is not implemented.

Headphone Amplifier
The headphone outputs are from the same audio power amplifier. The headphone jack will disconnect the audio output to the speakers when a headphone plug is inserted. Hence, the speakers are muted if a headphone is connected.
Resistors (items 3750 and 3752) limit the audio output to the HP against short circuits.

9.8.6 Audio: Lip Sync

A “lip sync” circuit with an 80 ms audio delay is added, in order to synchronise with video delay due to the complexity of the display processing. See table:

Table 9-2 Lip sync overview

Input	Speaker out(delay)	Monitor out(delay)	SCART1 out(delay)	SCART2 out(delay)
AV1	AV1 (80 ms)	AV1 (80 ms)	RF (none)	AV1 (80 ms)
AV2	AV2 (80 ms)	AV2 (80 ms)	RF (none)	RF (none)
AV3	AV3 (80 ms)	AV3 (80 ms)	RF (none)	AV3 (80 ms)
AV4	AV4 (80 ms)	AV4 (80 ms)	RF (none)	AV4 (80 ms)
RF	RF (80 ms)	RF (80 ms)	RF (80 ms)	RF (80 ms)

Note: SCART out not valid for NAFTA/Latam versions.

The video delay is significant, due to memory based processing. For instance, the “frame rate conversion” cause a delay of two frames, while the LCD panel response also cause a delay.

The circuit is a (16 bit) FIFO based digital delay. The memory size required for a 80 ms delay (with a data clock of 1.024 MHz) can be calculated with: Memory size = delay time * f_clk.
This gives: 80 ms * 1.024 MHz = 81920 bits.

To calculate the memory size for a 16 bits mode I2S digital audio stream we must use the following data:
- f_s = 32 kHz, 16 bits, stereo
- Data clock = 32 kHz * 16 * 2 = 1.024 MHz
- Memory size for 1 ms delay = 1 ms * 1.024 MHz = 1024 bits = 1 kbit

So, the delay time of 80 ms can be built with five steps of 16 ms, which is close to the frame rate. Therefore, a 128 kbit SRAM (16 x 8) is chosen.

9.9 Control

9.9.1 Painter

The microprocessor (SAA55xx, IC7064 called Painter) provides:
- Control functions for the TV-set.
- On Screen Display (OSD).
- Teletext functions.
- P50 (Easylink) communication.
- I/O-ports for I2C, RC5, LED, and service modes.
- Error code generation.

Ten pages TXT-data can be stored internally. For 100 pages, an external memory is used (IC7070).
The Non Volatile Memory IC7066 is a 4 kB version M24C32W6.

All ICs in this part are supplied with 3V5 that is also present during Standby. This voltage is supplied via voltage regulator IC7920.

For stable OSD and TXT, the display is synchronised to the TV signal processing device by way of horizontal and vertical sync signals provided by external circuits (H-SYNC and V-SYNC). From these signals, all display timings are derived.
The OSD/TXT RGB-outputs (46/47/48) and fast blanking (52) are fed to the BOCMA (pins 35 - 38).

9.9.2 I2C-busses

In this chassis, two I2C-busses used:
- Hardware I2C-bus, used for all IC communication.
- Separate short bus for the Non Volatile Memory (NVM), to avoid data corruption.

9.9.3 NVM

The Non Volatile Memory IC7066 contains all set related data that must be kept permanently, such as:
- Software identification.
- Operational hours.
- Error-codes.
- Option codes.
- All factory alignments.
- Last Status items for the customer + a complete factory recall.

9.9.4 Light control

A pair of light sensors, at the Front Control panel, is used to monitor the external ambient light condition and adjust the brightness, contrast, and any relevant video parameters of the display.

9.10 Inverter

1. Introduction
2. Control
3. Buck Converter
4. Royer Circuit
5. HV Circuit
6. Balance Circuit
7. Feedback Circuit
8. Protection Circuit

9.10.1 Introduction

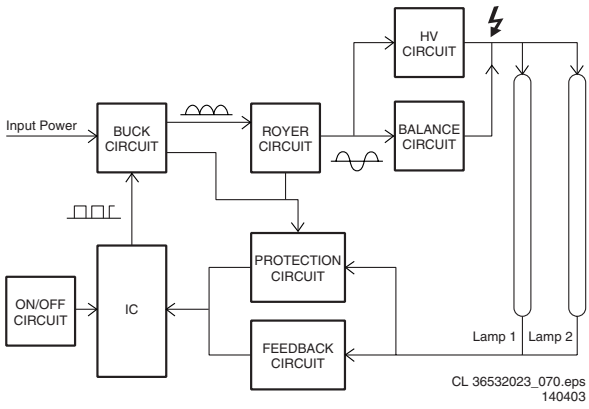


Figure 9-6 Block diagram Inverter Circuit

This is a separate panel (separate from LCD) for the 13” and 15” models, but is built-in in the 20” LCD panel.

This circuit is a basic DC/AC inverter for driving Cold Cathode Fluorescent Lamps (CCFL) who are located behind the LCD panel.

9.10.2 Control

The “On/Off circuit” delivers an input signal to turn the AC output voltage “on” or “off”:
- ON >= 2.5 V
- OFF <= 2.0 V

This signal switches transistorQ4 "on/off", resulting in "start/stop" of the buck converter.

9.10.3 Buck Converter

This circuit uses the Power MOSFET (item Q8) to control the input power for the Royer circuit. It is based on the "Buck Converter" principle. The transistor switch (Q8) is the heart of the buck converter, and it controls the power supplied to the load. It is controlled via a PWM controller (U1, LM339).
The LM339 controls the lamp current and brightness. Its functions include burst mode control, PWM control, and “soft start”.

Note: this circuit needs a minimum load, in order to work properly.

9.10.4 Royer Circuit

This is a standard Royer structure. It transfers the DC input signal into an AC output signal.
It is a self-resonant oscillator, where one transistor conducts current while the opposite one does not, and vice versa. The transformer core saturates in each half cycle, causing each transistor to switch "on" or "off".
The energy required to operate the transistors as switches, is supplied by the feedback windings of the transformer to the bases of the transistors.
The resistors R19 and R20 supply the base current for Q5 and Q6. Capacitor C10/C11 and transformer T1 define the oscillation frequency (working frequency). For the 13” model, the working frequency lies around 45 kHz, for the 15” model, this is about 47 kHz.

Example: If the primary voltage is 15 V_rms, and the transformer turn ratio is 100, the secondary voltage is about 15 * 100 = 1500 V_rms.

9.10.5 HV Circuit

The High Voltage (HV) circuit supplies the power to drive the lamps. The output voltage () is:
- 13” model: 540 V (with load), 1430 V (without load).
- 15” model: 645 V (with load), 1430 V (without load).

Note: Ensure that the backlight connectors are fully inserted, in order to prevent high voltage arcing.

9.10.6 Balance Circuit

The Balance circuit uses an LCR resonant mode, to control the output current. It delivers the same output current, even if the load is different.

9.10.7 Feedback Circuit

The sense voltage of the feedback circuit is set at half the 5 V supply voltage via R15 and R17 (at pin 9 of the comparator). The control IC compares this voltage with the output current, and regulates the PWM drive signal.

9.10.8 Protection Circuit

The protection circuit senses the output for current and for abnormal signal behaviour, in order to protect the inverter:

- Output current: It monitors the lamp current. If this current is correct, the inverter will operate continuous. If the current is incorrect, the inverter will be shut down. This means for instance that if one lamp is not working, the inverter will go into protection.
  Note: Be sure that the lamp connectors are connected properly.
- Abnormal signals: It monitors the signals from the PWM and Royer stage. If anything is wrong, the protection circuit will shutdown the inverter.

9.11 LCD Display

9.11.1 Specifications

Panel model	:	LC130V01 (13”)
	:	LC150X01 (15”)
	:	LC201V02 (20”)
Resolution (HxV)	:	640x480 pixels (13”)
	:	1280x768 pixels (15”)
	:	640x480 pixels (20”)
Luminance	:	450 nit (13”)
	:	450 nit (15”)
	:	450 nit (20”)
Contrast ratio	:	400 (13”)
	:	400 (15”)
	:	350 (20”)
Supplier	:	LG.Philips LCD

9.11.2 LCD Failure Modes

Figures below can be used to evaluate problems with the LCD display.

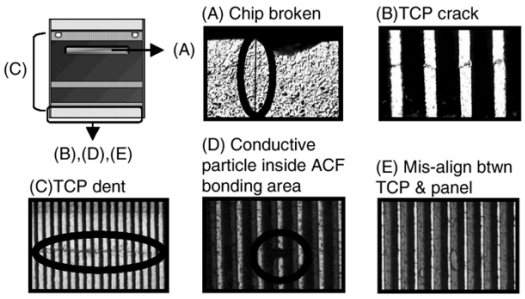
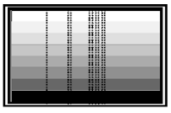
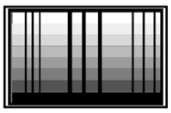
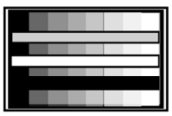
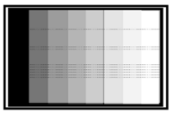
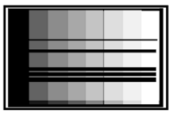
Defect Part	Failure Mode	Description	Phenomenon	Root Cause / Responsibility
TCP	V B/D	Block defect (Entire TCP defect)		Block defect : TCP crack or chip broken - Can find damaged mark Dim or L/D : TCP dent(External stress) - Can find damaged mark : TCP lead crack - Can find damaged mark : Conductive particle inside ACF bonding area : Conductive particle induced from outside of LCD or due to improper condition - Easy to find out responsibility with ingredient analysis for conductive particle : Mis-align between TCP & panel : Panel defect : TCP malfunction  • **Customer responsibility(Regardless of the No. of defective line)** **: In case of damaged marks such as TCP dent or chip broken** **: TCP crack due to interference with customer system** **: Mutually agreed defect as customer's responsibility** • **Supplier responsibility(Regardless of the No. of defective line)** **: The others**
	V Dim	Dim line		
	V L/D	Vertical line defect (Always bright or dark)		
	H B/D	Block type defect (Entire TCP defect)		
	H Dim	Dim line		
	H L/D	Vertical line defect (Always bright or dark)		

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Figure 9-7 LCD failure modes (1)

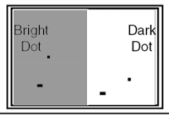
Defect Part	Failure Mode	Description	Phenomenon	Root Cause / Responsibility
Panel or Polarizer	Dot Defect	Panel has bright or dark dot. Sometimes adjacent 2 dot	 	**Malfunction of TFT inside panel.** **- Follow IIS(Incoming Inspection Standard)**
	Polarizer Bubble	Polarizer has bubbles		**Bubble between upper glass and polarizer.** **- Follow IIS(Incoming Inspection Standard)**
	Polarizer Scratch	Polarizer has scratch		**Hard or sharp tool made this defect.** **- Follow IIS(Incoming Inspection Standard)**
	F/M inside Polarizer	Foreign material inside polarizer. It shows linear or dot shape.		**Foreign material inside polarizer.** **- Follow IIS(Incoming Inspection Standard)**
	Yellowish /Purplish	Some area is different on white screen		**1. Panel gap between upper and down layer glass is not uniform** **2. Liquid crystal deteriorated** **3. Limit sample**
	Mura/ Mottling	Small area/ spot of un-uniformity /		**1. Panel gap between upper and down layer glass is not uniform** **2. Limit sample**

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Figure 9-8 LCD failure modes (2)

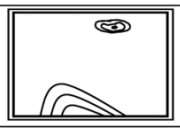
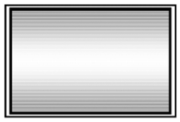
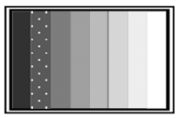
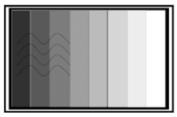
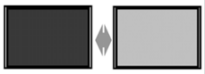
Defect Part	Failure Mode	Description	Phenomenon	Root Cause / Responsibility
Panel or Polarizer	New Ring	Ringed brightness uneven		Cell gap is not uniformity
	Chromaticity shift	Color coordinates is deviation		Transmittivity of panel declined (cell gap declined)
Circuit	Noise on grayscale	Noise on grayscale bar		Frame convertor IC(GMZ1) abnormal output(monitor system problem)
	Picture waving	Foreign material inside polarizer. It shows linear or dot shape.		Drive IC output is not stable (interference)
	Abnormal Display	Any kind of abnormal display except vertical or horizontal block defect.		1. Malfunction of any chipsets inside LCM - Customer responsibility 2. mechanical or electrical stress from customer system after analysis. - customer responsibility 3. Cold/short soldering of any components - Supplier responsibility 4. Poor connection between LCD and customer system. - Customer responsibility
	Flashing	Bright and dark display by turns.		

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Figure 9-9 LCD failure modes (3)

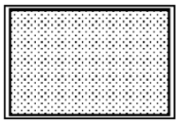
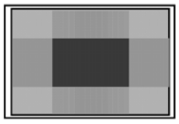
Defect Part	Failure Mode	Description	Phenomenon	Root Cause / Responsibility
Circuit	White Screen	LCD displays only white screen when B/L is normal condition. It corresponds to normally white mode.		1. LCD Fuse would be open because of surge current need to check compatibilty 2. LCM cable no connecting (normal white)
	Black Screen	LCD displays only black screen when B/L is normal condition. It corresponds to normally black mode.		1. LCD Fuse would be open because of surge current need to check compatibilty 2. LCM cable no connecting (normal Black, IPS)
	Flicker	LCD flickers at special pattern.		1. Vcom voltage in LCD is not balanced well - supplier responsibility but it can re-adjustable.
	Crosstalk	Brightness is different due to crosstalk at the pattern for crosstalk check.		1. An un-desired, parasite capacitance inside LCD panel can make vertical or horizontal crosstalk. All LCDs have weak crosstalk inevitably. But most of weak crosstalks are difficult to distinguish, especially with naked eye. 2. Follow IIS spec.
	Abnormal Color	LCD operate normally except different color.		1. Malfunction of any chipsets inside LCM-- Supplier responsibility 2. Mechanical or electrical stress from customer system after analysis- Customer responsibility 3. Cold/short soldering of any components-- supplier responsibility 4. Poor connection between LCD and customer system -- customer responsibility
	Saturation	Higher grayscale bars is mixed (on 32 grayscale pattern)		1. Drive IC DC level is not correct 2. Monitor system improper adjustment on sub_contrast/sub_bright

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Figure 9-10 LCD failure modes (4)

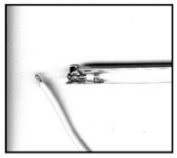
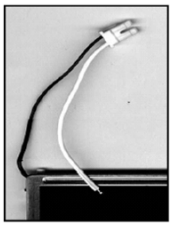
Defect Part	Failure Mode	Description	Phenomenon	Root Cause / Responsibility
Mechanical or B/L	Mechanical Noise	Mechanical noise heard when twisted.		Mechanical interference in back light unit. - Needs limit sample
	Ripple	Concentric circle formed		Mechanical interference between panel and any mechanical structure including back light unit, customer's connector or front bezel effects cell gap of the LCD. As a result, Concentric circle observed. - Mechanical Interference : need to co-work
	B/L off	B/L is not working without any damaged in appearance		1. Cold soldering between wire and lamp electrode supplier responsibility 2. Lamp broken -- Customer responsibility
	B/L dark	B/L is darker than normality		1. Cold soldering between wire and lamp electrode. 2. Intermittent short between wire and lamp housing. Supplier responsibility
	B/L wire damaged	B/L wire damaged		Mis handling or any interference with customer system - Customer responsibility
	B/L wire open	No B/L		Mis handling or any interference with customer system - Customer responsibility
	B/L shutdown	B/L shutdown after a period of time		Intermittent short between wire and lamp housing happened because the power consumption is over than capacity of B/L inverter. - LG.PHILIPS LCD responsibility
	F/M	B/L has foreign material. Black or white color, linear or circular type		Foreign material inside B/L unit - Depend on IIS(Incoming Inspection Standard)

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Figure 9-11 LCD failure modes (5)

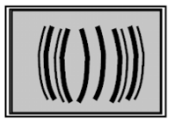
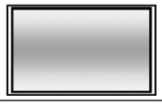
Defect Part	Failure Mode	Description	Phenomenon	Root Cause / Responsibility
Mechanical or B/L	Light leakage	Bottom part(B/L) of LCM is brighter than normal		Light from the B/L lamp directly shown through the irregular gap of B/L unit. - need to discuss or Needs limit sample
	Uniformity	B/L un-uniformity		Light is scattered by wrinkled sheet inside B/L unit. depend on product specification or Needs limit sample
	Mount hole	No mount hole or mount damaged		• No mount hole -- Supplier responsibility • Mount damaged -- Customer responsibility
	Low brightness	Brightness out of spec		Backlight declined due to diffuser isn't normal
	Panel crack	Panel glass is broken		1. Improper handle the panel 2. Poor packing on panel
Etc.	Label	No label or incorrect label or barcode can't read		Poor workmanship Supplier responsibility
	Can not screw	Impossible to screw		No spiral in nut or smaller diameter -- Supplier responsibility
	Etc.	Others		Any other defect that hard to classify into any defect item from above, should be classified into etc with detail description.

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Figure 9-12 LCD failure modes (6)

9.12 Abbreviation list

0/6/12	SCART switch control signal on A/V board. 0 = loop through (AUX to TV), 6 = play 16:9 format, 12 = play 4:3 format
1080i	1080 visible lines, interlaced
1080p	1080 visible lines, progressive scan
2CS	2 Carrier Stereo
480i	480 visible lines, interlaced
480p	480 visible lines, progressive scan
ACI	Automatic Channel Installation: algorithm that installs TV channels directly from a cable network by means of a predefined TXT page
ADC	Analogue to Digital Converter
AFC	Automatic Frequency Control: control signal used to tune to the correct frequency
AGC	Automatic Gain Control: algorithm that controls the video input of the feature box
AM	Amplitude Modulation
AP	Asia Pacific
AR	Aspect Ratio: 4 by 3 or 16 by 9
Artistic	See Painter 2.5: main processor
ASD	Automatic Standard Detection
AV	Audio Video
B-SC1-IN	Blue SCART1 in
B-SC2-IN	Blue SCART2 in
B-TXT	Blue teletext
B/G	Monochrome TV system. Sound carrier distance is 5.5 MHz
BOCMA	Bimos one Chip Mid-end Architecture: video and chroma decoder
C-FRONT	Chrominance front input
CBA	Circuit Board Assembly (or PWB)
CL	Constant Level: audio output to connect with an external amplifier
CLUT	Colour Look Up Table
ComPair	Computer aided rePair
CSM	Customer Service Mode
CVBS	Composite Video Blanking and Synchronisation
CVBS-EXT	CVBS signal from external source (VCR, VCD, etc.)
CVBS-INT	CVBS signal from Tuner
CVBS-MON	CVBS monitor signal
CVBS-TER-OUT	CVBS terrestrial out
DAC	Digital to Analogue Converter
DBE	Dynamic Bass Enhancement: extra low frequency amplification
DFU	Directions For Use: owner's manual
DNR	Dynamic Noise Reduction
DRAM	Dynamic RAM
DSP	Digital Signal Processing
DST	Dealer Service Tool: special (European) remote control designed for service technicians
DTS	Digital Theatre Sound
DVD	Digital Video Disc
EEPROM	Electrically Erasable and Programmable Read Only Memory
EPG	Electronic Program Guide: system used by broadcasters to transmit TV guide information (= NexTView)
EU	EUrope
EXT	EXTernal (source), entering the set by SCART or by cinches (jacks)
FBL	Fast Blanking: DC signal accompanying RGB signals
FBL-SC1-IN	Fast blanking signal for SCART1 in
FBL-SC2-IN	Fast blanking signal for SCART2 in
FBL-TXT	Fast Blanking Teletext
FLASH	FLASH memory
FM	Field Memory / Frequency Modulation
FMR	FM Radio
FRC	Frame Rate Converter
FRONT-C	Front input chrominance (SVHS)
FRONT-DETECT	Front input detection
FRONT-Y_CVBS	Front input luminance or CVBS (SVHS)
G-SC1-IN	Green SCART1 in
G-SC2-IN	Green SCART2 in
G-TXT	Green teletext
H	H_sync to the module
HA	Horizontal Acquisition: horizontal sync pulse coming out of the BOCMA
HD	High Definition
HP	HeadPhone
I	Monochrome TV system. Sound carrier distance is 6.0 MHz
I2C	Integrated IC bus
I2S	Integrated IC Sound bus
IC	Integrated Circuit
IF	Intermediate Frequency
Interlaced	Scan mode where two fields are used to form one frame. Each field contains half the number of the total amount of lines. The fields are written in "pairs", causing line flicker.
IR	Infra Red
IRQ	Interrupt ReQuest
Last Status	The settings last chosen by the customer and read and stored in RAM or in the NVM. They are called at start-up of the set to configure it according the customers wishes
LATAM	LATin AMerica
LC03	Philips chassis name for LCD TV 2003 project
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LINE-DRIVE	Line drive signal
L/L'	Monochrome TV system. Sound carrier distance is 6.5 MHz. L' is Band I, L is all bands except for Band I
LS	LoudSpeaker
LVDS	Low Voltage Differential Signalling, data transmission system for high speed and low EMI communication.
M/N	Monochrome TV system. Sound carrier distance is 4.5 MHz
MOSFET	Metal Oxide Semiconductor Field Effect Transistor
MPEG	Motion Pictures Experts Group
MSP	Multi-standard Sound Processor: ITT sound decoder
MUTE	MUTE Line
NC	Not Connected
NICAM	Near Instantaneous Compounded Audio Multiplexing. This is a digital sound system, used mainly in Europe.
NTSC	National Television Standard Committee. Colour system used mainly in North America and Japan. Colour carrier NTSC M/N = 3.579545 MHz, NTSC 4.43 = 4.433619 MHz (this is a VCR norm, it is not transmitted off-air)
NVM	Non Volatile Memory: IC containing TV related data (for example, options)
O/C	Open Circuit
ON/OFF LED	On/Off control signal for the LED
OSD	On Screen Display
P50	Project 50 communication: protocol between TV and peripherals
PAL	Phase Alternating Line. Colour system used mainly in Western Europe

	(colour carrier = 4.433619 MHz) and South America (colour carrier PAL M = 3.575612 MHz and PAL N = 3.582056 MHz)
PC	Personal Computer
PCB	Printed Circuit Board (or PWB)
PIG	Picture In Graphic
PIP	Picture In Picture
PLL	Phase Locked Loop. Used, for example, in FST tuning systems. The customer can directly provide the desired frequency
Progressive Scan	Scan mode where all scan lines are displayed in one frame at the same time, creating a double vertical resolution.
PWB	Printed Wiring Board (or PCB)
RAM	Random Access Memory
RC	Remote Control transmitter
RC5	Remote Control system 5, the signal from the remote control receiver
RGB	Red, Green, and Blue. The primary colour signals for TV. By mixing levels of R, G, and B, all colours (Y/C) are reproduced.
RGBHV	Red, Green, Blue, Horizontal sync, and Vertical sync
ROM	Read Only Memory
SAM	Service Alignment Mode
SIF	Sound Intermediate Frequency
SC	SandCastle: two-level pulse derived from sync signals
SC1-OUT	SCART output of the MSP audio IC
SC2-B-IN	SCART2 Blue in
SC2-C-IN	SCART2 chrominance in
SC2-OUT	SCART output of the MSP audio IC
S/C	Short Circuit
SCART	Syndicat des Constructeurs d'Appareils Radiorecepteurs et Televisieurs
SCL	CLock Signal on I2C bus
SD	Standard Definition
SDA	DAta Signal on I2C bus
SDRAM	Synchronous DRAM
SECAM	SEequence Couleur Avec Memoire. Colour system used mainly in France and Eastern Europe. Colour carriers = 4.406250 MHz and 4.250000 MHz
SIF	Sound Intermediate Frequency
SMPS	Switch Mode Power Supply
SND	SouND
SNDL-SC1-IN	Sound left SCART1 in
SNDL-SC1-OUT	Sound left SCART1 out
SNDL-SC2-IN	Sound left SCART2 in
SNDL-SC2-OUT	Sound left SCART2 out
SNDR-SC1-IN	Sound right SCART1 in
SNDR-SC1-OUT	Sound right SCART1 out
SNDR-SC2-IN	Sound right SCART2 out
SNDR-SC2-OUT	Sound right SCART2 out
SNDS-VL-OUT	Surround sound left variable level out
SNDS-VR-OUT	Surround sound right variable level out
SOPS	Self Oscillating Power Supply
S/PDIF	Sony Philips Digital InterFace
SRAM	Static RAM
STBY	STandBY
SVHS	Super Video Home System
SW	SubWoofer / SoftWare
THD	Total Harmonic Distortion
TXT	TeleteXT
uP	Microprocessor
VA	Vertical Acquisition
UVSH	UHF/VHF/S-Chanel Hyperband
VL	Variable Level out: processed audio output toward external amplifier
VCR	Video Cassette Recorder
VGA	Video Graphics Array
WD	Watch Dog
WYSIWYR	What You See Is What You Record: record selection that follows main picture and sound
XTAL	Quartz crystal
YPbPr	Component video (Y= Luminance, Pb/Pr= Colour difference signals)
Y/C	Luminance (Y) and Chrominance (C) signal
Y-OUT	Luminance-signal
YUV	Component video

9.13 IC Data Sheets

This section shows the internal block diagrams and pin layouts of ICs that are drawn as "black boxes" in the electrical diagrams (with the exception of "memory" and "logic" ICs).

9.13.1 Diagram C9, Type FIi2300 (IC7351)

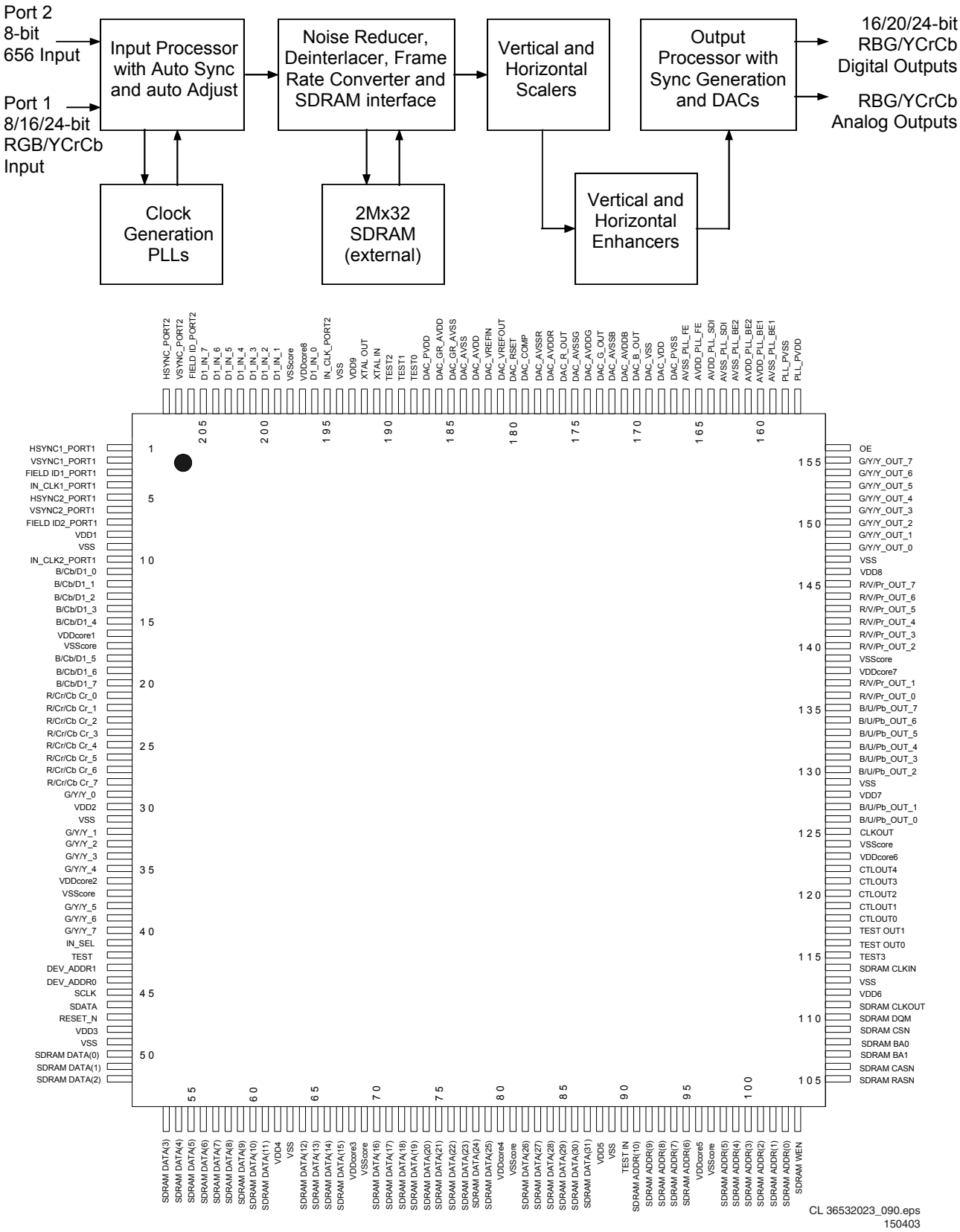

Figure 9-13 Internal Block Diagram and Pin Configuration

10. Spare Parts List

TV Board [A]

Various

1010	4822 265 11154	Connector 22p
1111	4822 267 10735	Connector 3p m
1231	2422 025 11244	Connector 7p m
1234	4822 267 10565	Connector 4p
1260	2422 025 16725	Connector SCART f m Bk
1267	2422 026 04926	Socket SVHS 4p f
1269	2422 026 05499	Socket CINCH 3p f RdWhYe
1330	4822 242 10685	Xtal 12MHz
1452	2422 549 44372	SAW 38.9MHz K3953L
1454	2422 549 44369	SAW 38.9MHz K9656L
1620	2422 543 01059	Xtal 18.432MHz
1731	2422 026 05449	Connector phono 1p f
1732	4822 267 10565	Connector 4p
1734	2422 025 16382	Connector 3p m
1902	4822 267 10565	Connector 4p
8010	3139 131 03011	Cable 22p 80mm
8902	3139 131 03081	Cable 4p 140mm

⊣⊢

2010	3198 016 38210	820pF 25V
2014	3198 017 41050	1µF 10V 0603
2015	3198 017 41050	1µF 10V 0603
2016	2238 586 59812	100nF 20-80% 50V 0603
2017	2238 586 59812	100nF 20-80% 50V 0603
2043	2020 021 91729	4.7µF 20% 35V
2044	2238 586 59812	100nF 20-80% 50V 0603
2045	4822 126 14507	18pF 5% 50V 0603
2046	4822 126 14507	18pF 5% 50V 0603
2049	4822 126 13879	220nF 20% 16V
2050	2020 552 94427	100pF 5% 50v 0603
2051	2238 586 59812	100nF 20-80% 50V 0603
2053	4822 124 23002	10µF 20% 16V
2055	5322 126 11578	1nF 10% 50V 0603
2057	2020 021 91729	4.7µF 20% 35V
2101	4822 122 33761	22pF 5% 50V
2102	4822 122 33761	22pF 5% 50V
2103	4822 124 12082	10µF 20% 50V
2104	3198 017 34730	47nF 16V 0603
2106	4822 124 80195	470µF 20% 10V
2107	2238 586 59812	100nF 20-80% 50V 0603
2108	4822 124 81044	470µF 20% 6.3V
2120	4822 126 13193	4.7nF 10% 63V
2121	4822 126 13193	4.7nF 10% 63V
2122	2020 552 94427	100pF 5% 50v 0603
2123	4822 126 14549	33nF 16V 0603
2124	4822 126 14549	33nF 16V 0603
2125	4822 126 13883	220pF 5% 50V
2126	4822 126 13193	4.7nF 10% 63V
2130	3198 016 31020	1nF 10% 25V 0603
2131	3198 016 31020	1nF 10% 25V 0603
2132	2238 586 59812	100nF 20-80% 50V 0603
2133	3198 016 31020	1nF 10% 25V 0603
2201	4822 126 14241	330pF 50V 0603
2203	4822 126 14241	330pF 50V 0603
2206	4822 126 14241	330pF 50V 0603
2208	4822 126 14241	330pF 50V 0603
2214	4822 126 14241	330pF 50V 0603
2224	4822 124 40433	47µF 20% 25V
2227	4822 126 14241	330pF 50V 0603
2233	4822 126 14241	330pF 50V 0603
2238	4822 126 14241	330pF 50V 0603
2242	4822 126 14241	330pF 50V 0603
2244	4822 126 14241	330pF 50V 0603
2249	4822 126 14241	330pF 50V 0603
2251	4822 126 14241	330pF 50V 0603
2253	4822 126 14241	330pF 50V 0603
2301	2238 586 59812	100nF 20-80% 50V 0603
2302	2238 916 15641	22nF 10% 25V 0603
2303	2238 586 59812	100nF 20-80% 50V 0603
2304	4822 124 23002	10µF 20% 16V
2308	2020 021 91729	4.7µF 20% 35V
2309	4822 126 13879	220nF 20% 16V
2311	4822 126 13879	220nF 20% 16V
2313	2238 586 59812	100nF 20-80% 50V 0603
2314	3198 017 41050	1µF 10V 0603
2315	3198 017 41050	1µF 10V 0603
2316	3198 017 41050	1µF 10V 0603
2317	4822 124 12084	1µF 20% 50V
2318	4822 126 13193	4.7nF 10% 63V
2319	2238 586 59812	100nF 20-80% 50V 0603
2320	4822 126 14238	2.2nF 50V 0603
2321	2238 586 59812	100nF 20-80% 50V 0603
2322	2238 586 59812	100nF 20-80% 50V 0603
2324	3198 016 31020	1nF 10% 25V 0603
2325	4822 124 23002	10µF 20% 16V
2326	4822 126 14508	180pF 5% 50V
2327	5322 122 33861	120pF10% 50V
2330	4822 122 33752	15pF 5% 50V
2331	4822 122 33752	15pF 5% 50V
2332	4822 122 33752	15pF 5% 50V
2335	3198 016 38210	820pF 25V
2336	2238 916 15641	22nF 10% 25V 0603
2337	2238 916 15641	22nF 10% 25V 0603
2338	2238 916 15641	22nF 10% 25V 0603
2339	2238 586 59812	100nF 20-80% 50V 0603
2340	4822 122 33741	10pF 10% 50V
2341	3198 017 44740	470nF 10V 0603
2342	3198 017 44740	470nF 10V 0603
2343	3198 017 44740	470nF 10V 0603
2344	2222 867 15339	33pF 5% 50V 0603
2345	2222 867 15339	33pF 5% 50V 0603
2346	5322 126 11583	10nF 10% 50V 0603
2347	5322 126 11583	10nF 10% 50V 0603
2348	3198 017 41050	1µF 10V 0603
2349	3198 017 41050	1µF 10V 0603
2350	3198 017 41050	1µF 10V 0603
2351	3198 017 41050	1µF 10V 0603
2361	4822 124 80151	47µF 20% 16V
2380	4822 126 13881	470pF 5% 50V
2381	3198 017 41050	1µF 10V 0603
2382	4822 126 13879	220nF 20% 16V
2390	2238 916 15641	22nF 10% 25V 0603
2391	4822 126 14241	330pF 50V 0603
2401	3198 017 41050	1µF 10V 0603
2402	3198 017 41050	1µF 10V 0603
2404	2238 916 15641	22nF 10% 25V 0603
2407	2238 586 59812	100nF 20-80% 50V 0603
2408	2238 586 59812	100nF 20-80% 50V 0603
2412	4822 126 13879	220nF 20% 16V
2415	4822 126 13879	220nF 20% 16V
2417	4822 124 23002	10µF 20% 16V
2418	3198 017 41050	1µF 10V 0603
2419	3198 017 41050	1µF 10V 0603
2424	4822 124 23002	10µF 20% 16V
2426	4822 124 23002	10µF 20% 16V
2428	3198 017 41050	1µF 10V 0603
2429	3198 017 34730	47nF 16V 0603
2432	3198 017 41050	1µF 10V 0603
2433	2020 552 94427	100pF 5% 50v 0603
2434	2020 552 94427	100pF 5% 50v 0603
2435	3198 017 34730	47nF 16V 0603
2448	2238 586 59812	100nF 20-80% 50V 0603
2452	5322 126 11583	10nF 10% 50V 0603
2453	5322 126 11583	10nF 10% 50V 0603
2601	2238 586 59812	100nF 20-80% 50V 0603
2602	2238 586 59812	100nF 20-80% 50V 0603
2603	2238 586 59812	100nF 20-80% 50V 0603
2604	2238 586 59812	100nF 20-80% 50V 0603
2605	2238 586 59812	100nF 20-80% 50V 0603
2610	4822 126 14226	82pF 5% 50V 0603
2611	4822 126 14226	82pF 5% 50V 0603
2612	4822 126 14241	330pF 50V 0603
2613	4822 126 13881	470pF 5% 50V
2620	4822 124 23002	10µF 20% 16V
2622	4822 126 11669	27pF 5% 50V 0603
2623	4822 126 14225	56pF 5% 50V 0603
2624	4822 122 33752	15pF 5% 50V
2625	4822 126 14508	180pF 5% 50V
2626	4822 126 11785	47pF 5% 50V 0603
2627	4822 126 13193	4.7nF 10% 63V
2628	4822 126 13193	4.7nF 10% 63V
2629	4822 126 13193	4.7nF 10% 63V
2630	4822 126 13193	4.7nF 10% 63V
2631	4822 126 13193	4.7nF 10% 63V
2632	4822 126 13193	4.7nF 10% 63V
2633	3198 017 41050	1µF 10V 0603
2634	3198 017 41050	1µF 10V 0603
2635	3198 017 41050	1µF 10V 0603
2636	3198 017 41050	1µF 10V 0603
2637	3198 017 41050	1µF 10V 0603
2638	3198 017 41050	1µF 10V 0603
2639	4822 126 13883	220pF 5% 50V
2640	3198 017 41050	1µF 10V 0603
2645	3198 016 31020	1nF 10% 25V 0603
2646	3198 016 31020	1nF 10% 25V 0603
2647	4822 126 11663	12pF 5% 50V 0603
2648	3198 017 41050	1µF 10V 0603
2649	3198 017 41050	1µF 10V 0603
2650	4822 124 23002	10µF 20% 16V
2651	2238 586 59812	100nF 20-80% 50V 0603
2652	2238 586 59812	100nF 20-80% 50V 0603
2653	5322 124 41945	22µF 20% 35V
2654	4822 126 13879	220nF 20% 16V
2655	4822 124 23002	10µF 20% 16V
2656	3198 016 31020	1nF 10% 25V 0603
2657	2238 586 59812	100nF 20-80% 50V 0603
2658	4822 124 23002	10µF 20% 16V
2661	3198 016 31020	1nF 10% 25V 0603
2662	3198 016 31020	1nF 10% 25V 0603
2668	3198 016 31020	1nF 10% 25V 0603
2669	3198 016 31020	1nF 10% 25V 0603
2670	3198 017 41050	1µF 10V 0603
2671	3198 017 41050	1µF 10V 0603
2674	3198 017 41050	1µF 10V 0603
2675	3198 017 41050	1µF 10V 0603
2676	4822 124 23002	10µF 20% 16V
2677	4822 126 13193	4.7nF 10% 63V
2678	4822 126 13193	4.7nF 10% 63V
2679	2238 586 59812	100nF 20-80% 50V 0603
2680	4822 126 13881	470pF 5% 50V
2681	2238 586 59812	100nF 20-80% 50V 0603
2682	3198 016 33380	3.3pF 50V 0603
2683	3198 016 33380	3.3pF 50V 0603
2684	3198 016 31020	1nF 10% 25V 0603
2688	4822 126 14491	2.2µF -20+80% 10V 0805
2689	3198 017 41050	1µF 10V 0603
2690	3198 017 41050	1µF 10V 0603
2731	4822 126 14549	33nF 16V 0603
2732	4822 124 40248	10µF 20% 63V
2733	4822 126 13879	220nF 20% 16V
2734	4822 124 12056	1000µF 20% 35V
2734	4822 124 81144	1000µF 16V
2735	3198 016 31020	1nF 10% 25V 0603
2736	3198 017 41050	1µF 10V 0603
2737	4822 126 13193	4.7nF 10% 63V
2737	5322 126 11579	3.3nF 10% 63V
2738	2020 012 93762	330µF 20% 50V
2739	2020 012 93762	330µF 20% 50V
2740	3198 016 31020	1nF 10% 25V 0603
2741	3198 017 41050	1µF 10V 0603
2742	4822 126 13193	4.7nF 10% 63V
2742	5322 126 11579	3.3nF 10% 63V
2745	4822 124 40207	100µF 20% 25V
2746	4822 124 21913	1µF 20% 63V
2750	4822 124 40248	10µF 20% 63V
2751	4822 126 13881	470pF 5% 50V
2752	4822 124 40248	10µF 20% 63V
2753	4822 126 13881	470pF 5% 50V
2799	4822 124 40255	100µF 20% 63V
2900	2238 586 59812	100nF 20-80% 50V 0603
2903	5322 126 11583	10nF 10% 50V 0603
2910	4822 123 14026	470µF 20% 35V
2910	4822 124 11767	470µF 20% 25V
2911	4822 126 13881	470pF 5% 50V
2911	4822 126 14506	270pF 5% 50V 0603
2913	4822 124 80791	470µF 20% 16V
2914	4822 126 13193	4.7nF 10% 63V
2920	4822 123 14026	470µF 20% 35V
2920	4822 124 11767	470µF 20% 25V
2921	4822 126 13881	470pF 5% 50V
2923	4822 124 40184	1000µF 20% 10V
2924	4822 126 13193	4.7nF 10% 63V
2931	4822 126 13881	470pF 5% 50V
2933	4822 124 80195	470µF 20% 10V
2934	4822 126 13193	4.7nF 10% 63V
2998	4822 124 81144	1000µF 16V
2999	4822 124 81144	1000µF 16V

–WW–

3002	4822 117 12902	8.2kΩ 1% 0.063W 0603
3002	5322 117 13056	8.2kΩ 1% 0.063W 0603
3003	4822 051 30103	10kΩ 5% 0.062W
3004	4822 117 12902	8.2kΩ 1% 0.063W 0603
3004	5322 117 13056	8.2kΩ 1% 0.063W 0603
3007	4822 117 12902	8.2kΩ 1% 0.063W 0603
3007	5322 117 13056	8.2kΩ 1% 0.063W 0603
3009	4822 117 12902	8.2kΩ 1% 0.063W 0603
3009	5322 117 13056	8.2kΩ 1% 0.063W 0603
3010	4822 051 30222	2.2kΩ 5% 0.062W
3013	4822 117 12902	8.2kΩ 1% 0.063W 0603
3013	5322 117 13056	8.2kΩ 1% 0.063W 0603
3014	4822 117 12902	8.2kΩ 1% 0.063W 0603
3014	5322 117 13056	8.2kΩ 1% 0.063W 0603
3015	4822 051 30103	10kΩ 5% 0.062W
3016	4822 051 30102	1kΩ 5% 0.062W
3017	4822 051 30101	100Ω 5% 0.062W
3018	4822 051 30101	100Ω 5% 0.062W
3019	4822 051 30101	100Ω 5% 0.062W
3021	4822 051 30101	100Ω 5% 0.062W
3021	4822 051 30561	560Ω 5% 0.062W
3022	4822 051 30222	2.2kΩ 5% 0.062W

3023	4822 117 12902	8.2kΩ 1% 0.063W 0603
3023	5322 117 13056	8.2kΩ 1% 0.063W 0603
3024	4822 051 30102	1kΩ 5% 0.062W
3030	4822 051 30102	1kΩ 5% 0.062W
3031	4822 051 30471	470Ω 5% 0.062W
3033	4822 051 30103	10kΩ 5% 0.062W
3034	4822 051 30101	100Ω 5% 0.062W
3035	4822 051 30471	470Ω 5% 0.062W
3037	4822 051 30101	100Ω 5% 0.062W
3042	4822 051 30151	150Ω 5% 0.062W
3043	4822 051 30151	150Ω 5% 0.062W
3044	4822 051 30103	10kΩ 5% 0.062W
3045	4822 051 30123	12kΩ 5% 0.062W
3046	4822 051 30472	4.7kΩ 5% 0.062W
3047	4822 051 30222	2.2kΩ 5% 0.062W
3048	4822 051 30222	2.2kΩ 5% 0.062W
3050	4822 051 30101	100Ω 5% 0.062W
3051	4822 117 13525	24kΩ 1% 0.62W 0603
3053	4822 051 30222	2.2kΩ 5% 0.062W
3054	4822 051 30103	10kΩ 5% 0.062W
3056	4822 117 12925	47kΩ 1% 0.063W 0603
3058	4822 051 30471	470Ω 5% 0.062W
3059	4822 051 30151	150Ω 5% 0.062W
3060	4822 051 30222	2.2kΩ 5% 0.062W
3061	4822 051 30471	470Ω 5% 0.062W
3062	4822 117 12925	47kΩ 1% 0.063W 0603
3063	4822 051 30222	2.2kΩ 5% 0.062W
3064	4822 051 30472	4.7kΩ 5% 0.062W
3065	4822 051 30472	4.7kΩ 5% 0.062W
3066	4822 117 12902	8.2kΩ 1% 0.063W 0603
3066	5322 117 13056	8.2kΩ 1% 0.063W 0603
3068	4822 117 12925	47kΩ 1% 0.063W 0603
3069	4822 051 30153	15kΩ 5% 0.062W
3070	4822 051 30273	27kΩ 5% 0.062W
3071	4822 117 13632	100kΩ 1% 0.62W 0603
3072	4822 117 13632	100kΩ 1% 0.62W 0603
3081	4822 051 30472	4.7kΩ 5% 0.062W
3082	4822 051 30103	10kΩ 5% 0.062W
3083	4822 051 30471	470Ω 5% 0.062W
3084	4822 051 30101	100Ω 5% 0.062W
3085	4822 051 30101	100Ω 5% 0.062W
3086	4822 051 30101	100Ω 5% 0.062W
3088	4822 051 30101	100Ω 5% 0.062W
3092	4822 051 30101	100Ω 5% 0.062W
3100	4822 051 30008	Jumper 0603
3101	4822 051 30008	Jumper 0603
3102	4822 051 30103	10kΩ 5% 0.062W
3103	4822 051 30152	1.5kΩ 5% 0.062W
3120	4822 051 30479	47Ω 5% 0.062W
3121	4822 051 30273	27kΩ 5% 0.062W
3122	4822 051 30333	33kΩ 5% 0.062W
3122	4822 117 13632	100kΩ 1% 0.62W 0603
3130	4822 117 11817	1.2kΩ 1% 0.062W
3131	4822 051 30271	270Ω 5% 0.062W
3132	4822 117 13632	100kΩ 1% 0.62W 0603
3133	4822 117 12968	820Ω 5% 0.62W
3134	4822 117 13632	100kΩ 1% 0.62W 0603
3135	4822 051 30561	560Ω 5% 0.062W
3201	4822 051 30151	150Ω 5% 0.062W
3202	4822 117 12891	220kΩ 1% 0.063W 0603
3203	4822 051 30151	150Ω 5% 0.062W
3204	4822 117 12925	47kΩ 1% 0.063W 0603
3206	4822 051 30151	150Ω 5% 0.062W
3207	4822 117 12891	220kΩ 1% 0.063W 0603
3208	4822 051 30151	150Ω 5% 0.062W
3209	4822 117 12925	47kΩ 1% 0.063W 0603
3211	4822 051 30759	75Ω 5% 0.062W
3212	4822 051 30101	100Ω 5% 0.062W
3213	4822 051 30223	22kΩ 5% 0.062W
3214	4822 051 30682	6.8kΩ 5% 0.062W
3216	4822 051 30759	75Ω 5% 0.062W
3217	4822 051 30101	100Ω 5% 0.062W
3218	4822 051 30759	75Ω 5% 0.062W
3219	4822 051 30101	100Ω 5% 0.062W
3221	4822 051 30759	75Ω 5% 0.062W
3222	4822 051 30101	100Ω 5% 0.062W
3223	4822 051 30689	68Ω 5% 0.063W 0603
3224	4822 051 30102	1kΩ 5% 0.062W
3225	5322 117 11726	10Ω 5%
3226	4822 051 30759	75Ω 5% 0.062W
3227	4822 051 30109	10Ω 5% 0.062W
3228	4822 051 30101	100Ω 5% 0.062W
3233	4822 051 30151	150Ω 5% 0.062W
3234	4822 117 12925	47kΩ 1% 0.063W 0603
3238	4822 051 30151	150Ω 5% 0.062W
3239	4822 117 12925	47kΩ 1% 0.063W 0603
3241	4822 051 30223	22kΩ 5% 0.062W
3242	4822 051 30682	6.8kΩ 5% 0.062W
3243	4822 051 30759	75Ω 5% 0.062W
3244	4822 051 30101	100Ω 5% 0.062W
3248	4822 051 30759	75Ω 5% 0.062W
3249	4822 051 30101	100Ω 5% 0.062W
3251	4822 117 12891	220kΩ 1% 0.063W 0603
3252	4822 051 30151	150Ω 5% 0.062W
3253	4822 117 12891	220kΩ 1% 0.063W 0603
3254	4822 051 30151	150Ω 5% 0.062W
3303	4822 051 30391	390Ω 5% 0.062W
3304	4822 051 30101	100Ω 5% 0.062W
3307	4822 051 30101	100Ω 5% 0.062W
3308	4822 051 30101	100Ω 5% 0.062W
3309	4822 051 30109	10Ω 5% 0.062W
3310	4822 051 30101	100Ω 5% 0.062W
3311	4822 051 30102	1kΩ 5% 0.062W
3313	4822 051 30109	10Ω 5% 0.062W
3314	4822 051 30102	1kΩ 5% 0.062W
3315	4822 051 30471	470Ω 5% 0.062W
3316	4822 051 30471	470Ω 5% 0.062W
3316	4822 051 30681	680Ω 5% 0.062W
3317	4822 051 30153	15kΩ 5% 0.062W
3318	4822 051 30273	27kΩ 5% 0.062W
3319	4822 051 30103	10kΩ 5% 0.062W
3321	4822 051 30332	3.3kΩ 5% 0.062W
3322	4822 051 30332	3.3kΩ 5% 0.062W
3324	4822 051 30393	39kΩ 5% 0.062W
3326	4822 051 30479	47Ω 5% 0.062W
3327	4822 051 30102	1kΩ 5% 0.062W
3328	4822 051 30152	1.5kΩ 5% 0.062W
3329	4822 117 12889	270kΩ 1% 0.063W 0603
3330	4822 051 30102	1kΩ 5% 0.062W
3331	4822 051 30101	100Ω 5% 0.062W
3332	4822 051 30101	100Ω 5% 0.062W
3333	4822 051 30151	150Ω 5% 0.062W
3334	4822 051 30151	150Ω 5% 0.062W
3335	4822 051 30151	150Ω 5% 0.062W
3339	4822 051 30101	100Ω 5% 0.062W
3340	4822 051 30101	100Ω 5% 0.062W
3341	4822 051 30101	100Ω 5% 0.062W
3342	4822 051 30101	100Ω 5% 0.062W
3345	4822 051 30101	100Ω 5% 0.062W
3346	4822 051 30102	1kΩ 5% 0.062W
3347	4822 051 30102	1kΩ 5% 0.062W
3348	4822 051 30109	10Ω 5% 0.062W
3349	4822 051 30101	100Ω 5% 0.062W
3350	4822 051 30109	10Ω 5% 0.062W
3351	4822 051 30271	270Ω 5% 0.062W
3352	4822 051 30151	150Ω 5% 0.062W
3353	4822 051 30103	10kΩ 5% 0.062W
3354	4822 051 30271	270Ω 5% 0.062W
3355	4822 051 30151	150Ω 5% 0.062W
3357	4822 051 30271	270Ω 5% 0.062W
3358	4822 051 30151	150Ω 5% 0.062W
3360	4822 051 30008	Jumper 0603
3380	4822 051 30223	22kΩ 5% 0.062W
3381	4822 051 30562	5.6kΩ 5% 0.063W 0603
3382	4822 051 30103	10kΩ 5% 0.062W
3383	4822 051 30472	4.7kΩ 5% 0.062W
3384	4822 051 30472	4.7kΩ 5% 0.062W
3385	4822 051 30471	470Ω 5% 0.062W
3386	4822 051 30561	560Ω 5% 0.062W
3387	4822 051 30103	10kΩ 5% 0.062W
3388	4822 051 30272	2.7kΩ 5% 0.062W
3389	4822 051 30183	18kΩ 5% 0.062W
3390	4822 051 30472	4.7kΩ 5% 0.062W
3391	4822 051 30103	10kΩ 5% 0.062W
3392	4822 051 30154	150kΩ 5% 0.062W
3393	4822 051 30472	4.7kΩ 5% 0.062W
3394	4822 051 30273	27kΩ 5% 0.062W
3395	4822 051 30271	270Ω 5% 0.062W
3401	4822 051 30101	100Ω 5% 0.062W
3402	4822 051 30101	100Ω 5% 0.062W
3404	4822 051 30101	100Ω 5% 0.062W
3411	4822 051 30152	1.5kΩ 5% 0.062W
3412	4822 051 30152	1.5kΩ 5% 0.062W
3413	4822 051 30102	1kΩ 5% 0.062W
3414	4822 051 30152	1.5kΩ 5% 0.062W
3415	4822 051 30152	1.5kΩ 5% 0.062W
3416	4822 051 30102	1kΩ 5% 0.062W
3417	4822 051 30109	10Ω 5% 0.062W
3418	4822 051 30109	10Ω 5% 0.062W
3426	4822 051 30102	1kΩ 5% 0.062W
3427	4822 051 30102	1kΩ 5% 0.062W
3428	4822 051 30102	1kΩ 5% 0.062W
3429	4822 051 30109	10Ω 5% 0.062W
3430	4822 051 30101	100Ω 5% 0.062W
3431	4822 051 30102	1kΩ 5% 0.062W
3432	4822 051 30008	Jumper 0603
3433	4822 051 30101	100Ω 5% 0.062W
3434	4822 051 30101	100Ω 5% 0.062W
3436	4822 051 30102	1kΩ 5% 0.062W
3437	4822 051 30101	100Ω 5% 0.062W
3455	4822 051 30682	6.8kΩ 5% 0.062W
3456	4822 051 30222	2.2kΩ 5% 0.062W
3457	4822 051 30273	27kΩ 5% 0.062W
3458	4822 051 30183	18kΩ 5% 0.062W
3461	4822 051 30222	2.2kΩ 5% 0.062W
3481	4822 051 30472	4.7kΩ 5% 0.062W
3610	4822 051 30471	470Ω 5% 0.062W
3611	4822 117 12925	47kΩ 1% 0.063W 0603
3620	4822 051 30101	100Ω 5% 0.062W
3621	4822 051 30101	100Ω 5% 0.062W
3622	4822 051 30222	2.2kΩ 5% 0.062W
3633	4822 051 30102	1kΩ 5% 0.062W
3634	4822 051 30102	1kΩ 5% 0.062W
3635	4822 051 30102	1kΩ 5% 0.062W
3636	4822 051 30102	1kΩ 5% 0.062W
3637	4822 051 30102	1kΩ 5% 0.062W
3638	4822 051 30102	1kΩ 5% 0.062W
3640	4822 051 30102	1kΩ 5% 0.062W
3645	4822 051 30102	1kΩ 5% 0.062W
3646	4822 051 30102	1kΩ 5% 0.062W
3650	4822 051 30223	22kΩ 5% 0.062W
3651	4822 051 30101	100Ω 5% 0.062W
3652	4822 051 30101	100Ω 5% 0.062W
3655	4822 051 30101	100Ω 5% 0.062W
3656	4822 051 30101	100Ω 5% 0.062W
3732	4822 117 12891	220kΩ 1% 0.063W 0603
3735	4822 051 30183	18kΩ 5% 0.062W
3735	4822 051 30273	27kΩ 5% 0.062W
3736	4822 051 30392	3.9kΩ 5% 0.063W 0603
3736	4822 051 30682	6.8kΩ 5% 0.062W
3739	4822 051 30102	1kΩ 5% 0.062W
3740	4822 051 30183	18kΩ 5% 0.062W
3740	4822 051 30273	27kΩ 5% 0.062W
3741	4822 051 30392	3.9kΩ 5% 0.063W 0603
3741	4822 051 30682	6.8kΩ 5% 0.062W
3743	4822 051 30102	1kΩ 5% 0.062W
3744	4822 051 30472	4.7kΩ 5% 0.062W
3745	4822 051 30332	3.3kΩ 5% 0.062W
3745	4822 051 30472	4.7kΩ 5% 0.062W
3746	4822 051 30102	1kΩ 5% 0.062W
3746	4822 051 30562	5.6kΩ 5% 0.063W 0603
3747	4822 051 30472	4.7kΩ 5% 0.062W
3748	5322 117 13056	8.2kΩ 1% 0.063W 0603
3750	4822 051 30471	470Ω 5% 0.062W
3752	4822 051 30471	470Ω 5% 0.062W
3799	4822 117 12891	220kΩ 1% 0.063W 0603
3900	4822 051 30102	1kΩ 5% 0.062W
3901	4822 051 30102	1kΩ 5% 0.062W
3903	4822 051 30153	15kΩ 5% 0.062W
3904	4822 117 12891	220kΩ 1% 0.063W 0603
3905	4822 117 12891	220kΩ 1% 0.063W 0603
3906	4822 051 30223	22kΩ 5% 0.062W
3911	4822 117 12917	1Ω 5% 0.062W 0603
3912	4822 117 12917	1Ω 5% 0.062W 0603
3913	2322 704 61002	1kΩ 1% 0603
3913	5322 117 13018	1kΩ 1% 0.063W 0603
3914	5322 117 13031	5.6kΩ 1% 0603
3915	4822 117 12917	1Ω 5% 0.062W 0603
3921	4822 117 12917	1Ω 5% 0.062W 0603
3923	2322 704 61002	1kΩ 1% 0603
3923	5322 117 13018	1kΩ 1% 0.063W 0603
3924	5322 117 13046	1.8kΩ 1% 0.063W 0603
3925	4822 052 11109	10Ω 5% 0.5W
3930	4822 117 12917	1Ω 5% 0.062W 0603
3930	4822 117 13613	2.2Ω 5% 0603
3931	4822 117 12917	1Ω 5% 0.062W 0603
3932	2322 704 61002	1kΩ 1% 0603
3932	5322 117 13018	1kΩ 1% 0.063W 0603
3933	5322 117 13048	3.3kΩ 1% 0.063W 0603
4xxx	4822 051 30008	Jumper 0603
4xxx	4822 051 20008	Jumper 0805

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5040	4822 157 10977	4.7µH 10%
5041	4822 157 10977	4.7µH 10%
5042	3198 018 64780	4.7µH 5%
5120	2422 535 94713	1000µF 10%
5121	2422 535 94713	1000µF 10%
5122	2422 536 00059	12µH 10%
5301	4822 157 71334	0.68µH
5302	4822 157 71334	0.68µH
5303	4822 157 71334	0.68µH
5326	4822 157 10586	2.2µH 10% 0805
5426	4822 157 71334	0.68µH
5427	4822 157 71334	0.68µH
5451	4822 157 71334	0.68µH
5452	4822 157 71303	0.39µH 10% 0805
5601	4822 157 71304	1µH 10% 0805
5620	3198 018 61080	1µH 5%
5621	3198 018 61590	15µH 5% 1008
5650	3198 018 61080	1µH 5%
5733	4822 157 11737	22µH 10%
5900	2422 536 00059	12µH 10%
5901	2422 549 44197	Bead 220Ω at 100MHz
5911	2422 535 94648	220µH 10%
5921	2422 535 94648	220µH 10%
5930	4822 157 11869	33µH 10%
5931	2422 535 94648	220µH 10%

6031	9340 548 42115	PDZ2.4B
6101	9340 548 71115	PDZ33B
6102	4822 130 11397	BAS316
6120	5322 130 34337	BAV99
6207	4822 130 10852	BZX284-C6V8
6208	4822 130 10852	BZX284-C6V8
6211	9340 548 61115	PDZ12B
6218	9340 548 61115	PDZ12B
6238	9340 548 61115	PDZ12B
6239	9340 548 61115	PDZ12B
6243	9340 548 61115	PDZ12B
6244	9340 548 61115	PDZ12B
6253	9340 548 61115	PDZ12B
6254	9340 548 61115	PDZ12B
6281	9340 548 61115	PDZ12B
6282	9340 548 61115	PDZ12B
6283	9340 548 61115	PDZ12B
6284	9340 548 61115	PDZ12B
6285	9340 548 61115	PDZ12B
6286	9340 548 61115	PDZ12B
6287	9340 548 61115	PDZ12B
6288	9340 548 61115	PDZ12B
6289	9340 548 61115	PDZ12B
6290	9340 548 61115	PDZ12B
6291	9340 548 61115	PDZ12B
6292	9340 548 61115	PDZ12B
6327	4822 130 11397	BAS316
6380	4822 130 11397	BAS316
6390	4822 130 11397	BAS316
6412	4822 130 11397	BAS316
6415	4822 130 11397	BAS316
6451	4822 130 11525	1SS356
6650	4822 130 11397	BAS316
6731	9340 548 61115	PDZ12B
6732	9340 548 61115	PDZ12B
6910	9322 128 70685	SMSS14
6920	9322 128 70685	SMSS14
6925	9322 128 70685	SMSS14
6930	9322 128 70685	SMSS14

7053	9340 425 20115	BC847BS
7062	3198 010 42310	BC847BW
7063	3198 010 42310	BC847BW
7064	9965 000 23142	LC13EG1-1.05
7064	9965 000 23143	LC13EG2-1.05
7066	9322 156 81668	M24C32-WMN6TNKSA
7067	3198 010 42310	BC847BW
7068	3198 010 42310	BC847BW
7069	3198 010 42310	BC847BW
7120	3198 010 42310	BC847BW
7130	5322 130 42718	BFS20
7131	5322 130 42718	BFS20
7224	5322 130 60159	BC846B
7301	9352 626 19557	TDA8885
7302	3198 010 42310	BC847BW
7303	3198 010 42310	BC847BW
7330	3198 010 42310	BC847BW
7350	3198 010 42310	BC847BW
7353	3198 010 42310	BC847BW
7356	3198 010 42310	BC847BW
7380	3198 010 42310	BC847BW
7381	3198 010 42310	BC847BW
7382	3198 010 42310	BC847BW
7383	3198 010 42310	BC847BW
7384	3198 010 42310	BC847BW
7385	3198 010 42310	BC847BW
7390	3198 010 42310	BC847BW
7391	3198 010 42310	BC847BW
7401	9351 869 40118	74HC4053PW
7405	9352 630 99118	TDA9181T
7412	9340 425 20115	BC847BS
7427	3198 010 42310	BC847BW
7428	3198 010 42310	BC847BW
7452	3198 010 42310	BC847BW
7471	3198 010 42310	BC847BW
7601	9322 167 76668	TC74HC590AF
7602	9322 167 76668	TC74HC590AF
7603	4822 209 91023	UM62256EM-70LL
7604	5322 209 31276	SN74HCT573DW
7605	5322 209 31276	SN74HCT573DW
7610	3198 010 42310	BC847BW
7620	9322 195 11671	MSP3410G-QI-C12
7674	4822 130 63732	MMUN2212
7675	4822 130 63732	MMUN2212
7678	4822 130 63732	MMUN2212
7679	4822 130 63732	MMUN2212
7731	9322 148 81667	AN5277
7731	9322 181 41682	AN7522N
7732	9352 500 20118	74LVC08AD
7739	5322 130 60159	BC846B
7744	3198 010 42310	BC847BW
7745	3198 010 42310	BC847BW
7900	9322 157 51685	SI12301DS
7900	9322 190 77685	SI2307DS
7901	4822 130 11155	PDTC114ET
7903	5322 130 60159	BC846B
7904	5322 130 60159	BC846B
7910	4822 209 60059	MC34063AP1
7920	4822 209 60059	MC34063AP1
7930	4822 209 60059	MC34063AP1

Scaler Board [C]

Various

1001	8238 277 11021	Socket power 1p f
1002	8238 277 10841	Fuse 7A 125V
1003	4822 267 10565	Connector 4p
1301	2422 543 01255	Xtal 24.576MHz 30pF
1341	4822 265 11352	Connector 8p
1351	2422 543 01246	Xtal 13.5MHz 12pF DSX840
1501	2422 025 18059	Connector 41p m
1506	2422 025 18024	Connector 40p m
1681	4822 265 11154	Connector 22p
8341	3139 110 27991	Cable 8p 80mm
8341	3139 110 28001	Cable 8p 100mm

2001	2238 586 59812	100nF 20-80% 50V 0603
2002	2238 586 59812	100nF 20-80% 50V 0603
2005	2238 586 59812	100nF 20-80% 50V 0603
2006	4822 124 80151	47µF 20% 16V
2007	4822 124 11767	470µF 20% 25V
2008	4822 124 11767	470µF 20% 25V
2009	4822 123 14026	470µF 20% 35V
2009	4822 124 11767	470µF 20% 25V
2010	4822 123 14026	470µF 20% 35V
2015	4822 124 11767	470µF 20% 25V
2016	2238 586 59812	100nF 20-80% 50V 0603
2017	4822 124 80151	47µF 20% 16V
2020	4822 126 13193	4.7nF 10% 63V
2021	5322 126 11583	10nF 10% 50V 0603
2024	4822 123 14026	470µF 20% 35V
2025	4822 126 13881	470pF 5% 50V
2026	4822 124 11767	470µF 20% 25V
2027	4822 124 11767	470µF 20% 25V
2028	2238 586 59812	100nF 20-80% 50V 0603
2029	4822 124 11767	470µF 20% 25V
2301	4822 122 33753	150pF 5% 50V
2302	4822 122 33753	150pF 5% 50V
2303	4822 122 33753	150pF 5% 50V
2304	3198 017 34730	47nF 16V 0603
2305	3198 017 34730	47nF 16V 0603
2306	4822 122 33753	150pF 5% 50V
2307	4822 122 33753	150pF 5% 50V
2308	3198 017 34730	47nF 16V 0603
2309	4822 122 33753	150pF 5% 50V
2310	4822 122 33753	150pF 5% 50V
2311	4822 122 33753	150pF 5% 50V
2315	3198 017 34730	47nF 16V 0603
2316	3198 017 34730	47nF 16V 0603
2317	3198 017 34730	47nF 16V 0603
2318	3198 017 34730	47nF 16V 0603
2319	3198 017 34730	47nF 16V 0603
2321	2020 552 96507	10µF 10V
2323	2238 586 59812	100nF 20-80% 50V 0603
2324	2238 586 59812	100nF 20-80% 50V 0603
2325	2020 552 96507	10µF 10V
2326	2020 552 96507	10µF 10V
2327	2238 586 59812	100nF 20-80% 50V 0603
2328	2238 586 59812	100nF 20-80% 50V 0603
2329	2238 586 59812	100nF 20-80% 50V 0603
2331	2238 586 59812	100nF 20-80% 50V 0603
2332	2238 586 59812	100nF 20-80% 50V 0603
2333	2238 586 59812	100nF 20-80% 50V 0603
2334	4822 122 33752	15pF 5% 50V
2335	4822 122 33752	15pF 5% 50V
2336	4822 126 14221	68PF 5% NP0 50V 0603
2338	2238 586 59812	100nF 20-80% 50V 0603
2339	2238 586 59812	100nF 20-80% 50V 0603
2341	2020 552 96507	10µF 10V
2342	2238 586 59812	100nF 20-80% 50V 0603
2343	2238 586 59812	100nF 20-80% 50V 0603
2344	4822 124 80151	47µF 20% 16V
2345	2238 586 59812	100nF 20-80% 50V 0603
2346	2238 586 59812	100nF 20-80% 50V 0603
2347	2238 586 59812	100nF 20-80% 50V 0603
2348	2020 552 96507	10µF 10V
2349	4822 126 14238	2.2nF 50V 0603
2351	2020 552 96507	10µF 10V
2352	2020 552 96507	10µF 10V
2353	2238 586 59812	100nF 20-80% 50V 0603
2354	2020 552 96507	10µF 10V
2355	2020 552 96507	10µF 10V
2356	2222 867 15339	33pF 5% 50V 0603
2357	2020 552 96507	10µF 10V
2358	2222 867 15339	33pF 5% 50V 0603
2359	2238 586 59812	100nF 20-80% 50V 0603
2361	2020 552 96507	10µF 10V
2362	2238 586 59812	100nF 20-80% 50V 0603
2363	2238 586 59812	100nF 20-80% 50V 0603
2364	2238 586 59812	100nF 20-80% 50V 0603
2365	2238 586 59812	100nF 20-80% 50V 0603
2366	2238 586 59812	100nF 20-80% 50V 0603
2367	2238 586 59812	100nF 20-80% 50V 0603
2368	2238 586 59812	100nF 20-80% 50V 0603
2369	2238 586 59812	100nF 20-80% 50V 0603
2371	2238 586 59812	100nF 20-80% 50V 0603
2372	2238 586 59812	100nF 20-80% 50V 0603
2373	2238 586 59812	100nF 20-80% 50V 0603
2374	2238 586 59812	100nF 20-80% 50V 0603
2375	2238 586 59812	100nF 20-80% 50V 0603
2376	2020 552 96507	10µF 10V
2377	2020 552 96507	10µF 10V
2378	2238 586 59812	100nF 20-80% 50V 0603
2379	2238 586 59812	100nF 20-80% 50V 0603
2381	2020 552 96507	10µF 10V
2382	2238 586 59812	100nF 20-80% 50V 0603
2383	2238 586 59812	100nF 20-80% 50V 0603
2384	2238 586 59812	100nF 20-80% 50V 0603
2385	2238 586 59812	100nF 20-80% 50V 0603
2386	2238 586 59812	100nF 20-80% 50V 0603
2387	2238 586 59812	100nF 20-80% 50V 0603
2388	2238 586 59812	100nF 20-80% 50V 0603
2389	2238 586 59812	100nF 20-80% 50V 0603
2391	2020 552 96507	10µF 10V
2392	2238 586 59812	100nF 20-80% 50V 0603
2393	2238 586 59812	100nF 20-80% 50V 0603
2394	2238 586 59812	100nF 20-80% 50V 0603
2395	2020 552 96507	10µF 10V
2396	2238 586 59812	100nF 20-80% 50V 0603
2397	2238 586 59812	100nF 20-80% 50V 0603
2501	4822 126 13879	220nF 20% 16V
2504	4822 126 13879	220nF 20% 16V
2512	4822 126 13879	220nF 20% 16V
2513	4822 126 13879	220nF 20% 16V
2516	5322 126 11583	10nF 10% 50V 0603
2517	5322 126 11583	10nF 10% 50V 0603
2518	5322 126 11583	10nF 10% 50V 0603
2521	4822 126 13879	220nF 20% 16V

3001	4822 051 30103	10kΩ 5% 0.062W
3002	4822 051 30472	4.7kΩ 5% 0.062W
3003	4822 117 12925	47kΩ 1% 0.063W 0603
3004	4822 051 30223	22kΩ 5% 0.062W
3005	4822 051 30103	10kΩ 5% 0.062W
3006	4822 051 30223	22kΩ 5% 0.062W
3009	4822 117 12917	1Ω 5% 0.062W 0603
3010	4822 117 12917	1Ω 5% 0.062W 0603
3014	4822 051 30103	10kΩ 5% 0.062W
3015	4822 051 30103	10kΩ 5% 0.062W
3016	4822 051 30103	10kΩ 5% 0.062W
3016	4822 117 12917	1Ω 5% 0.062W 0603
3017	4822 117 12925	47kΩ 1% 0.063W 0603
3018	4822 051 30223	22kΩ 5% 0.062W
3019	2322 704 61402	1.4kΩ 1% 0603
3020	5322 117 13028	12kΩ 1% 0.063W 0603
3304	4822 051 30151	150Ω 5% 0.062W
3305	4822 051 30151	150Ω 5% 0.062W
3306	4822 051 30151	150Ω 5% 0.062W
3307	4822 051 30101	100Ω 5% 0.062W
3312	4822 117 12917	1Ω 5% 0.062W 0603
3313	4822 051 30472	4.7kΩ 5% 0.062W
3314	4822 051 30332	3.3kΩ 5% 0.062W
3315	4822 051 30479	47Ω 5% 0.062W
3316	4822 051 30479	47Ω 5% 0.062W
3321	4822 051 30479	47Ω 5% 0.062W
3322	4822 051 30101	100Ω 5% 0.062W
3324	4822 117 13573	4 x 47Ω 5%
3325	4822 117 13573	4 x 47Ω 5%
3326	4822 051 30479	47Ω 5% 0.062W
3327	4822 051 30101	100Ω 5% 0.062W
3328	4822 051 30101	100Ω 5% 0.062W
3342	4822 051 30103	10kΩ 5% 0.062W
3343	4822 051 30471	470Ω 5% 0.062W
3346	2350 035 10229	4 x 22Ω 5%
3347	2350 035 10229	4 x 22Ω 5%
3348	2350 035 10229	4 x 22Ω 5%
3349	2350 035 10229	4 x 22Ω 5%
3350	4822 117 12917	1Ω 5% 0.062W 0603
3351	2350 035 10229	4 x 22Ω 5%

3352	4822 117 12917	1Ω 5% 0.062W 0603
3354	4822 051 30471	470Ω 5% 0.062W
3355	2350 035 10229	4 x 22Ω 5%
3356	4822 051 30471	470Ω 5% 0.062W
3357	4822 051 30471	470Ω 5% 0.062W
3359	2350 035 10229	4 x 22Ω 5%
3360	4822 117 12139	22Ω 5% 0.062W
3361	4822 051 30103	10kΩ 5% 0.062W
3362	4822 051 30103	10kΩ 5% 0.062W
3363	4822 051 30103	10kΩ 5% 0.062W
3364	4822 051 30474	470kΩ 5% 0.062W
3365	4822 051 30181	180Ω 5% 0.062W
3366	4822 117 12917	1Ω 5% 0.062W 0603
3368	4822 051 30472	4.7kΩ 5% 0.062W
3369	4822 051 30103	10kΩ 5% 0.062W
3370	4822 117 12139	22Ω 5% 0.062W
3371	4822 117 12139	22Ω 5% 0.062W
3372	2350 035 10229	4 x 22Ω 5%
3372	4822 117 13573	4 x 47Ω 5%
3373	2350 035 10229	4 x 22Ω 5%
3373	4822 117 13573	4 x 47Ω 5%
3374	2350 035 10229	4 x 22Ω 5%
3374	4822 117 13573	4 x 47Ω 5%
3375	2350 035 10229	4 x 22Ω 5%
3375	4822 117 13573	4 x 47Ω 5%
3376	2350 035 10229	4 x 22Ω 5%
3376	4822 117 13573	4 x 47Ω 5%
3377	2350 035 10229	4 x 22Ω 5%
3377	4822 117 13573	4 x 47Ω 5%
3379	4822 117 12139	22Ω 5% 0.062W
3380	4822 117 12139	22Ω 5% 0.062W
3381	4822 117 12139	22Ω 5% 0.062W
3382	4822 051 30472	4.7kΩ 5% 0.062W
3383	4822 117 12139	22Ω 5% 0.062W
3384	4822 117 12139	22Ω 5% 0.062W
3385	4822 117 12139	22Ω 5% 0.062W
3386	2350 035 10229	4 x 22Ω 5%
3387	2350 035 10229	4 x 22Ω 5%
3388	4822 051 30759	75Ω 5% 0.062W
3389	4822 051 30759	75Ω 5% 0.062W
3391	4822 051 30759	75Ω 5% 0.062W
3394	2350 035 10229	4 x 22Ω 5%
3395	4822 117 12139	22Ω 5% 0.062W
3396	4822 051 30472	4.7kΩ 5% 0.062W
3507	4822 051 30103	10kΩ 5% 0.062W
3511	4822 051 30103	10kΩ 5% 0.062W
3516	4822 051 30109	10Ω 5% 0.062W
3517	4822 051 30109	10Ω 5% 0.062W
3681	4822 051 30472	4.7kΩ 5% 0.062W
3682	4822 051 30472	4.7kΩ 5% 0.062W
4xxx	4822 051 30008	Jumper 0603

5001	2422 536 00504	68µH 10%
5002	2422 535 94639	10µH 20%
5003	2422 549 45333	Bead 120Ω at 100MHz
5009	2422 535 94639	10µH 20%
5010	2422 549 45333	Bead 120Ω at 100MHz
5011	2422 549 45333	Bead 120Ω at 100MHz
5013	2422 549 45333	Bead 120Ω at 100MHz
5014	2422 549 45333	Bead 120Ω at 100MHz
5015	4822 157 11869	33µH 10%
5025	2422 535 94648	220µH 10%
5026	2422 535 94639	10µH 20%
5301	2422 549 45333	Bead 120Ω at 100MHz
5302	2422 549 45333	Bead 120Ω at 100MHz
5303	2422 549 45333	Bead 120Ω at 100MHz
5304	2422 549 45333	Bead 120Ω at 100MHz
5351	2422 549 45333	Bead 120Ω at 100MHz
5352	2422 549 45333	Bead 120Ω at 100MHz
5353	2422 549 45333	Bead 120Ω at 100MHz
5354	2422 549 45333	Bead 120Ω at 100MHz
5355	2422 549 45333	Bead 120Ω at 100MHz
5356	2422 549 45333	Bead 120Ω at 100MHz
5357	2422 549 45333	Bead 120Ω at 100MHz
5501	2422 549 45333	Bead 120Ω at 100MHz
5504	2422 549 45333	Bead 120Ω at 100MHz
5512	2422 549 45333	Bead 120Ω at 100MHz
5513	2422 549 45333	Bead 120Ω at 100MHz
5517	2422 549 45333	Bead 120Ω at 100MHz
5521	2422 549 45333	Bead 120Ω at 100MHz

6001	4822 130 11522	UDZ15B
6001	9340 548 69115	PDZ27B
6002	9322 082 82668	SS34
6025	9322 128 70685	SMSS14

7001	9322 142 69667	LM2596T-5.0
7002	5322 130 60159	BC846B
7003	5322 130 60159	BC846B
7004	5322 130 60159	BC846B
7005	9322 115 29668	SI9433DY
7005	9965 000 13595	SI4431DY (SO8)
7006	9322 189 19668	LD1086D2T18
7009	9322 152 53687	LD1086V33
7010	4822 209 60059	MC34063AP1
7011	4822 209 17398	LD1117DT33
7301	4822 209 17398	LD1117DT33
7302	9352 673 95518	SAA7118E/V1
7351	9322 190 49671	FLI2300-AB
7352	9322 190 51671	MT48LC2M32B2TG-5
7501	9322 171 82668	SN75LVDS83DGGR

Top Control Panel [E]

Various

1500	4822 267 10567	Connector 4P
1501	4822 276 13775	Switch
1502	4822 276 13775	Switch
1503	4822 276 13775	Switch
1504	4822 276 13775	Switch
1505	4822 276 13775	Switch

3500	4822 051 30101	100Ω 5% 0.062W
3501	4822 051 30391	390Ω 5% 0.062W
3502	4822 051 30561	560Ω 5% 0.062W
3503	4822 051 30271	270Ω 5% 0.062W
3504	4822 051 30332	3.3kΩ 5% 0.062W
3505	4822 051 30152	1.5kΩ 5% 0.062W

6500	9340 548 61115	PDZ12B
6504	4822 130 80622	BAT54

Inverter Panel [IN]

Various

	9965 000 05478	PMBS3904
	9965 000 08855	MMBT3904LT1
	9965 000 12392	MMBT3906LT1
	9965 000 12394	TP0610T
	9965 000 12957	PMBS3906
	9965 000 17807	Connector 3p
	9965 000 17814	2N7002E
	9965 000 17824	Transf. DC-AC inverter
	9965 000 21128	5pF 3kV 1808
CN1	9965 000 17806	Connector 8p
CN2	9965 000 17807	Connector 3p
CN3	9965 000 17807	Connector 3p
CN3	9965 000 23100	Connector 3p
CN4	9965 000 17807	Connector 3p
CN5	9965 000 17807	Connector 3p
CN5	9965 000 23100	Connector 3p
F01	9965 000 11546	Fuse KE40 1206
F01	9965 000 12955	Fuse 5A
F01	9965 000 23106	Fuse 3A 1206

C01	4822 126 14585	100nF 10% 50V
C01	9965 000 17804	1µF 50V 0805
C01	9965 000 21129	10.4nF 16V 0603
C02	4822 126 14118	100nF 20-80% 50V 0805
C03	9965 000 05466	10.4nF 16V 0603
C03	9965 000 05476	100nF 25V 0603
C03	9965 000 23095	100nF 25V 0603
C04	2222 586 18812	100nF 10% 50V 0603
C04	9965 000 05465	1µF 10V 0603
C04	9965 000 14741	220µF 25V
C05	4822 126 13751	47nF 10% 63V
C05	9965 000 14741	220µF 25V
C05	9965 000 21130	47.3nF 25V 0603
C06	9965 000 17805	68.2nF 50V 0603
C06	9965 000 21131	22,5nF 25V 1206
C07	9965 000 05466	10.4nF 16V 0603
C07	9965 000 21131	22,5nF 25V 1206
C08	9965 000 05466	10.4nF 16V 0603
C08	9965 000 21131	22,5nF 25V 1206
C09	9965 000 21131	22,5nF 25V 1206
C0T	9965 000 21132	GJ-EE0803-002
C10	9965 000 17802	0.15µF
C10	9965 000 21133	68.2pF 50V 0603
C11	9965 000 17802	0.15µF
C11	9965 000 21134	10.5nF
C12	5322 126 11583	10nF 10% 50V 0603
C12	9965 000 05464	10.3nF 50V 0603
C12	9965 000 21138	10,3nF 50V 0603
C14	9965 000 21139	221G 50V 0603
C16	9965 000 21131	22,5nF 25V 1206
C17	5322 122 33063	2,2PF 5%NP0 50V
C17	9965 000 21140	47.2nF 50V 0805
C18	2020 558 90659	12pF 5% 3kV
C19	5322 122 31866	6.8nF 10% 63V
C19	9965 000 05465	1µF 10V 0603
C19	9965 000 21140	47.2nF 50V 0805
C20	9965 000 21131	22,5nF 25V 1206
C21	4822 126 14247	1.5nF 50V 0603
C21	9965 000 21141	15.2nF 50V 0603
C22	9965 000 14747	47.4nF 10V 0603
C22	9965 000 23096	220nF 10V 0603
C23	2020 552 96671	1µF 10% 25V 1206
C23	9965 000 21142	10.5nF 10V 0805
C24	4822 126 14585	100nF 10% 50V
C24	9965 000 05465	1µF 10V 0603
C25	9965 000 05465	1µF 10V 0603
C25	9965 000 18606	1µF 16V
C26	2020 558 90659	12pF 5% 3kV
C27	9965 000 21143	39pF 3kV 1808
C27	9965 000 23097	47pF
C28	5322 122 31866	6.8nF 10% 63V
C28	9965 000 21140	47.2nF 50V 0805
C29	9965 000 21143	39pF 3kV 1808
C29	9965 000 23097	47pF
C30	5322 122 33063	2,2PF 5%NP0 50V
C30	9965 000 21140	47.2nF 50V 0805
C30	9965 000 23126	10nF
C31	9965 000 23126	10nF
C32	9965 000 14741	220µF 25V
C32	9965 000 23098	220µF
C32	9965 000 23126	10nF
C33	9965 000 21143	39pF 3kV 1808
C33	9965 000 23097	47pF
C33	9965 000 23126	10nF
C34	9965 000 21143	39pF 3kV 1808
C34	9965 000 23097	47pF
C35	4822 126 13751	47nF 10% 63V
C35	9965 000 21130	47.3nF 25V 0603
C37	4822 126 12105	33nF 5% 50V
C37	9965 000 14745	33.3nF 50V 0805
C39	4822 126 12105	33nF 5% 50V
C39	9965 000 14745	33.3nF 50V 0805
C40	9965 000 21143	39pF 3kV 1808
C40	9965 000 23097	47pF
C42	4822 051 20008	Jumper 0805
C43	4822 051 20008	Jumper 0805
C43	9965 000 23099	220pF
C44	4822 126 12105	33nF 5% 50V
C44	9965 000 14745	33.3nF 50V 0805
C45	4822 126 12105	33nF 5% 50V
C45	9965 000 14745	33.3nF 50V 0805
C47	9965 000 21143	39pF 3kV 1808
C47	9965 000 23097	47pF
C48	9965 000 14741	220µF 25V
C48	9965 000 23098	220µF
C49	4822 051 20008	Jumper 0805
C50	4822 051 20008	Jumper 0805
C51	4822 051 20008	Jumper 0805
C51	9965 000 23099	220pF
C52	4822 051 20008	Jumper 0805
C52	9965 000 17804	1µF 50V 0805
C53	2020 558 90659	12pF 5% 3kV
C53	9965 000 21144	5pF 3KV 1808
C54	5322 126 11583	10nF 10% 50V 0603
C55	2020 558 90659	12pF 5% 3kV
C55	9965 000 17804	1µF 50V 0805
C55	9965 000 21144	5pF 3KV 1808
C56	5322 126 11583	10nF 10% 50V 0603
C56	9965 000 21138	10,3nF 50V 0603
CT5	9965 000 23101	GJ-EE0803-002

R00	4822 051 20008	Jumper 0805
R00	4822 051 30008	Jumper 0603
R01	4822 051 30333	33kΩ 5% 0.062W
R02	4822 051 30103	10kΩ 5% 0.062W
R02	4822 051 30333	33kΩ 5% 0.062W
R02	9965 000 05488	10kΩ 5% 0603
R03	4822 051 30333	33kΩ 5% 0.062W
R03	9965 000 21146	100kΩ 5% 0603
R03	9965 000 23109	22Ω 5% 0603

R04	4822 051 30103	10kΩ 5% 0.062W
R04	4822 051 30333	33kΩ 5% 0.062W
R04	9965 000 05488	10kΩ 5% 0603
R05	2322 704 63002	3kΩ 1% 0603
R05	4822 051 30008	Jumper 0603
R05	9965 000 23109	22Ω 5% 0603
R06	4822 051 30105	1MΩ 5% 0.062W
R06	4822 117 12706	10kΩ 1% 0.063W 0603
R07	4822 051 10511	510Ω 2% 0.25W
R07	4822 051 30105	1MΩ 5% 0.062W
R08	4822 051 10104	100kΩ 2% 0.25W
R08	9965 000 17817	1Ω 1% 0805
R08	9965 000 21147	100kΩ 5% 1206
R09	4822 051 10104	100kΩ 2% 0.25W
R09	4822 051 30109	10Ω 5% 0.062W
R09	9965 000 21147	100kΩ 5% 1206
R10	4822 051 10104	100kΩ 2% 0.25W
R10	9965 000 17821	3.74kΩ 1% 0603
R10	9965 000 21147	100kΩ 5% 1206
R11	2322 704 62002	2kΩ 1% 0603
R11	4822 051 30008	Jumper 0603
R11	9965 000 23109	22Ω 5% 0603
R12	9965 000 17823	34kΩ 1% 0603
R12	9965 000 21148	51.1kΩ 1% 0603
R13	2322 704 62002	2kΩ 1% 0603
R14	4822 051 10104	100kΩ 2% 0.25W
R14	9965 000 23127	21Ω 1% 0603
R15	9965 000 17822	33.2kΩ 1% 0603
R15	9965 000 23109	22Ω 5% 0603
R16	5322 117 13017	100Ω 1% 0.063W 0603
R16	9965 000 21149	105Ω 0603 1%
R16	9965 000 23128	120kΩ 5% 0603
R17	4822 051 30102	1kΩ 5% 0.062W
R17	5322 117 13019	100kΩ 1% 0.063W 0603
R17	9965 000 21150	1kΩ 0603 5%
R18	4822 051 10104	100kΩ 2% 0.25W
R18	9965 000 05488	10kΩ 5% 0603
R19	9965 000 05488	10kΩ 5% 0603
R19	9965 000 20794	390Ω 5% 0.5W
R20	9965 000 20794	390Ω 5% 0.5W
R20	9965 000 21151	392kΩ 1% 0603
R21	4822 051 10104	100kΩ 2% 0.25W
R21	5322 117 13018	1kΩ 1% 0.063W 0603
R21	9965 000 21146	100kΩ 5% 0603
R22	4822 117 12706	10kΩ 1% 0.063W 0603
R22	9965 000 21152	28kΩ 1% 0603
R22	9965 000 23110	30.1kΩ 1% 0603
R23	5322 117 13017	100Ω 1% 0.063W 0603
R23	9965 000 21149	105Ω 0603 1%
R24	9965 000 23111	22.1Ω 1% 0603
R24	9965 000 23129	210Ω 1% 0603
R25	4822 051 30103	10kΩ 5% 0.062W
R25	9965 000 05488	10kΩ 5% 0603
R25	9965 000 20795	182kΩ 1% 0603
R26	4822 051 30008	Jumper 0603
R26	4822 051 30103	10kΩ 5% 0.062W
R26	9965 000 05488	10kΩ 5% 0603
R27	9965 000 21153	590kΩ 1% 0603
R27	9965 000 23112	887kΩ 1% 0603
R28	4822 051 30103	10kΩ 5% 0.062W
R28	9965 000 05488	10kΩ 5% 0603
R29	4822 051 30339	33Ω 5% 0.062W
R29	9965 000 21154	33Ω 5% 0603
R30	4822 051 30103	10kΩ 5% 0.062W
R30	9965 000 05488	10kΩ 5% 0603
R30	9965 000 21147	100kΩ 5% 1206
R31	9965 000 21146	100kΩ 5% 0603
R31	9965 000 21147	100kΩ 5% 1206
R31	9965 000 23109	22Ω 5% 0603
R32	4822 051 10104	100kΩ 2% 0.25W
R32	9965 000 21147	100kΩ 5% 1206
R32	9965 000 21155	9.09Ω 1% 0603
R33	4822 051 10104	100kΩ 2% 0.25W
R33	9965 000 21147	100kΩ 5% 1206
R33	9965 000 21156	76.8kΩ 1% 0603
R34	4822 051 10104	100kΩ 2% 0.25W
R34	9965 000 21147	100kΩ 5% 1206
R34	9965 000 21157	1MΩ 1% 0603
R35	9965 000 21147	100kΩ 5% 1206
R35	9965 000 21158	35.7kΩ 1% 0603
R36	9965 000 21146	100kΩ 5% 0603
R36	9965 000 21147	100kΩ 5% 1206
R36	9965 000 23109	22Ω 5% 0603
R37	4822 051 10104	100kΩ 2% 0.25W
R37	4822 051 10105	1MΩ 5% 0.25W
R37	9965 000 21146	100kΩ 5% 0603
R38	9965 000 05483	1K 5% 1206
R38	9965 000 05484	348kΩ 1% 0603
R38	9965 000 21153	590kΩ 1% 0603
R39	4822 051 10104	100kΩ 2% 0.25W
R39	9965 000 21147	100kΩ 5% 1206
R40	4822 051 10104	100kΩ 2% 0.25W
R40	9965 000 21147	100kΩ 5% 1206
R40	9965 000 23130	200Ω 5% 0.5W
R41	4822 051 10104	100kΩ 2% 0.25W
R41	9965 000 21147	100kΩ 5% 1206
R42	9965 000 23116	5.1Ω 1% 0603
R43	4822 051 30223	22kΩ 5% 0.062W
R43	9965 000 21159	22kΩ 5% 0603
R44	4822 051 30223	22kΩ 5% 0.062W
R44	9965 000 21159	22kΩ 5% 0603
R45	4822 051 10104	100kΩ 2% 0.25W
R45	9965 000 21147	100kΩ 5% 1206
R46	4822 051 10104	100kΩ 2% 0.25W
R46	9965 000 21147	100kΩ 5% 1206
R47	9965 000 17507	6.8k 5% 0.1W
R48	4822 051 30153	15kΩ 5% 0.062W
R49	4822 051 20472	4.7kΩ 5% 0.1W
R49	9965 000 21160	10kΩ 1% 0805
R50	4822 051 10221	220Ω 2% 0,25W
R50	9965 000 21161	220Ω 5% 1206
R51	9965 000 23117	53.6kΩ 1% 0603
R52	5322 117 13019	100kΩ 1% 0.063W 0603
R53	9965 000 23116	5.1Ω 1% 0603
R54	4822 051 10104	100kΩ 2% 0.25W
R54	9965 000 21147	100kΩ 5% 1206
R55	9965 000 23118	340kΩ 1% 0603
R56	4822 051 10104	100kΩ 2% 0.25W
R56	9965 000 21147	100kΩ 5% 1206
R57	4822 051 10104	100kΩ 2% 0.25W
R57	9965 000 21147	100kΩ 5% 1206
R58	4822 051 10104	100kΩ 2% 0.25W
R58	9965 000 21147	100kΩ 5% 1206
R59	9965 000 23119	422kΩ 1% 0603
R60	5322 117 13019	100kΩ 1% 0.063W 0603
R60	9965 000 17820	2MΩ 5% 0603
R61	5322 117 13019	100kΩ 1% 0.063W 0603
R61	9965 000 05482	14kΩ 1% 0603
R62	4822 117 12706	10kΩ 1% 0.063W 0603
R62	5322 117 13019	100kΩ 1% 0.063W 0603
R63	4822 051 30105	1MΩ 5% 0.062W
R63	9965 000 21162	4.7kΩ 5% 0603
R63	9965 000 23120	5.49kΩ 1% 0603
R64	4822 051 20008	Jumper 0805
R64	4822 051 30008	Jumper 0603
R64	4822 117 12706	10kΩ 1% 0.063W 0603
R65	9965 000 21155	9.09Ω 1% 0603
R66	4822 051 10104	100kΩ 2% 0.25W
R66	9965 000 21147	100kΩ 5% 1206
R67	4822 051 10104	100kΩ 2% 0.25W
R67	9965 000 21147	100kΩ 5% 1206
R68	4822 051 10104	100kΩ 2% 0.25W
R68	9965 000 21147	100kΩ 5% 1206
R70	4822 051 10104	100kΩ 2% 0.25W
R70	9965 000 21147	100kΩ 5% 1206
R71	4822 051 10104	100kΩ 2% 0.25W
R71	9965 000 21147	100kΩ 5% 1206
R72	4822 051 10104	100kΩ 2% 0.25W
R72	9965 000 21147	100kΩ 5% 1206
R73	9965 000 21163	1.37MΩ 1% 1206
R75	4822 117 11645	470Ω 1% 0.125W
R75	9965 000 21164	470Ω 5% 1206

L01	9965 000 06270	RLZ5.1B
L01	9965 000 20791	33µH
L01	9965 000 23107	350mH
L02	9965 000 06270	RLZ5.1B
L02	9965 000 20791	33µH
L02	9965 000 23107	350mH
L03	9965 000 06270	RLZ5.1B
L03	9965 000 23107	350mH
L04	9965 000 06270	RLZ5.1B
L04	9965 000 23107	350mH
L05	9965 000 06270	RLZ5.1B
L05	9965 000 23107	350mH
L06	9965 000 06270	RLZ5.1B
L06	9965 000 23107	350mH
L30	9965 000 12391	SPC-1005P-354-SMD
L31	9965 000 12391	SPC-1005P-354-SMD
T01	9965 000 17824	Transf. DC-AC inverter
T02	9965 000 17824	Transf. DC-AC inverter

D01	5322 130 34337	BAV99
D01	9965 000 12954	RLZ5.6B
D02	5322 130 83609	LS4148/GS08
D02	9965 000 21145	RLZ3.9B
D02	9965 000 23102	RLZ5.1B/TE-11
D03	9965 000 17809	SR24 SMA
D04	9965 000 06270	RLZ5.1B
D04	9965 000 17808	RLZ18B/TE-11
D04	9965 000 23103	RLZ5.1B/TE-11
D05	5322 130 83609	LS4148/GS08
D05	9965 000 06270	RLZ5.1B
D05	9965 000 23103	RLZ5.1B/TE-11
D06	9965 000 14749	BZM55B75-TR
D06	9965 000 23104	BZM55B75-TR
D07	9965 000 14749	BZM55B75-TR
D07	9965 000 23104	BZM55B75-TR
D08	9965 000 17809	SR24 SMA
D09	5322 130 34337	BAV99
D15	9965 000 12954	RLZ5.6B
D15	9965 000 23105	RLZ5.6C/TE-11
D16	5322 130 34337	BAV99
D26	5322 130 34337	BAV99
D29	5322 130 34337	BAV99
D30	5322 130 34337	BAV99
D30	9965 000 14749	BZM55B75-TR
D30	9965 000 23104	BZM55B75-TR
D31	5322 130 34337	BAV99
D31	9965 000 14749	BZM55B75-TR
D31	9965 000 23104	BZM55B75-TR
D32	9965 000 14749	BZM55B75-TR
D33	9965 000 14749	BZM55B75-TR
D34	5322 130 83609	LS4148/GS08

Q01	9965 000 08855	MMBT3904LT1
Q01	9965 000 12956	BSS138 (SOT23)
Q01	9965 000 17814	2N7002E
Q02	4822 130 11057	2N7002
Q02	9965 000 12392	MMBT3906LT1
Q02	9965 000 17814	2N7002E
Q03	9965 000 08855	MMBT3904LT1
Q03	9965 000 23108	PMBS3904 SOT23
Q04	4822 130 11057	2N7002
Q04	9965 000 17810	NDS0610
Q04	9965 000 17814	2N7002E
Q05	9965 000 08855	MMBT3904LT1
Q06	9965 000 12392	MMBT3906LT1
Q08	9965 000 08855	MMBT3904LT1
Q08	9965 000 17815	SI4425DY
Q08	9965 000 23108	PMBS3904 SOT23
Q09	9965 000 12326	2SD1804T-TL
Q10	9965 000 12326	2SD1804T-TL
Q11	9339 728 80215	PMBS3906 SOT23
Q11	9965 000 12392	MMBT3906LT1
Q14	4822 130 11057	2N7002
Q22	4822 130 11057	2N7002
Q22	9965 000 17814	2N7002E
Q50	4822 130 11057	2N7002
Q51	4822 130 11057	2N7002
Q53	9965 000 08855	MMBT3904LT1
U01	9965 000 12327	LM339AM
U01	9965 000 12960	IOZ960DS
U01	9965 000 23121	OZ960DS
U02	9965 000 21165	AO4600 (SO8)
U03	9965 000 21165	AO4600 (SO8)
U04	9965 000 21165	AO4600 (SO8)
U05	9965 000 21165	AO4600 (SO8)
U06	9965 000 21166	LM392M (SO8)
U07	9965 000 21166	LM392M (SO8)

Front LED Panel [J]

Various

1170	2422 025 12491	Connector 7p m

2177	4822 124 41643	100µF 20% 16V

3171	4822 051 30222	2.2kΩ 5% 0.062W
3172	4822 051 30222	2.2kΩ 5% 0.062W
3173	4822 051 30103	10kΩ 5% 0.062W
3174	4822 051 30391	390Ω 5% 0.062W
3175	4822 051 30103	10kΩ 5% 0.062W
3176	4822 051 30391	390Ω 5% 0.062W
3177	4822 051 30221	220Ω 5% 0.062W

6175	9322 192 35676	SPR-325MVW
6177	9322 189 66667	TSOP1836LL3V

7173	4822 130 60373	BC856B
7175	4822 130 60373	BC856B

11. Revision List

Manual xxxx xxx xxxx.0

- First release.

Manual xxxx xxx xxxx.1

- Chapter 3: DFU was wrong and is changed to the correct version.
- Chapter 5: ComPair instruction added.
- Chapter 7: Small corrections in diagrams, like diversity table and mapping.
- Chapter 10: Parts list updated.
- Chapter 11: This chapter added.
- Other chapters: small updates and corrections